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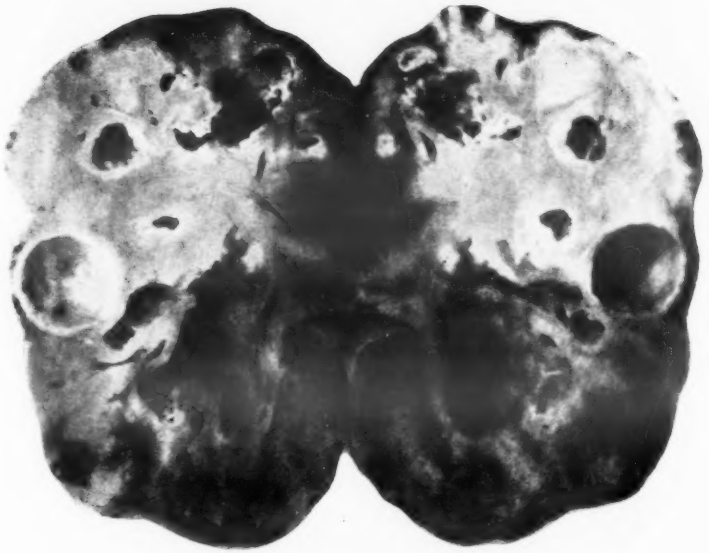
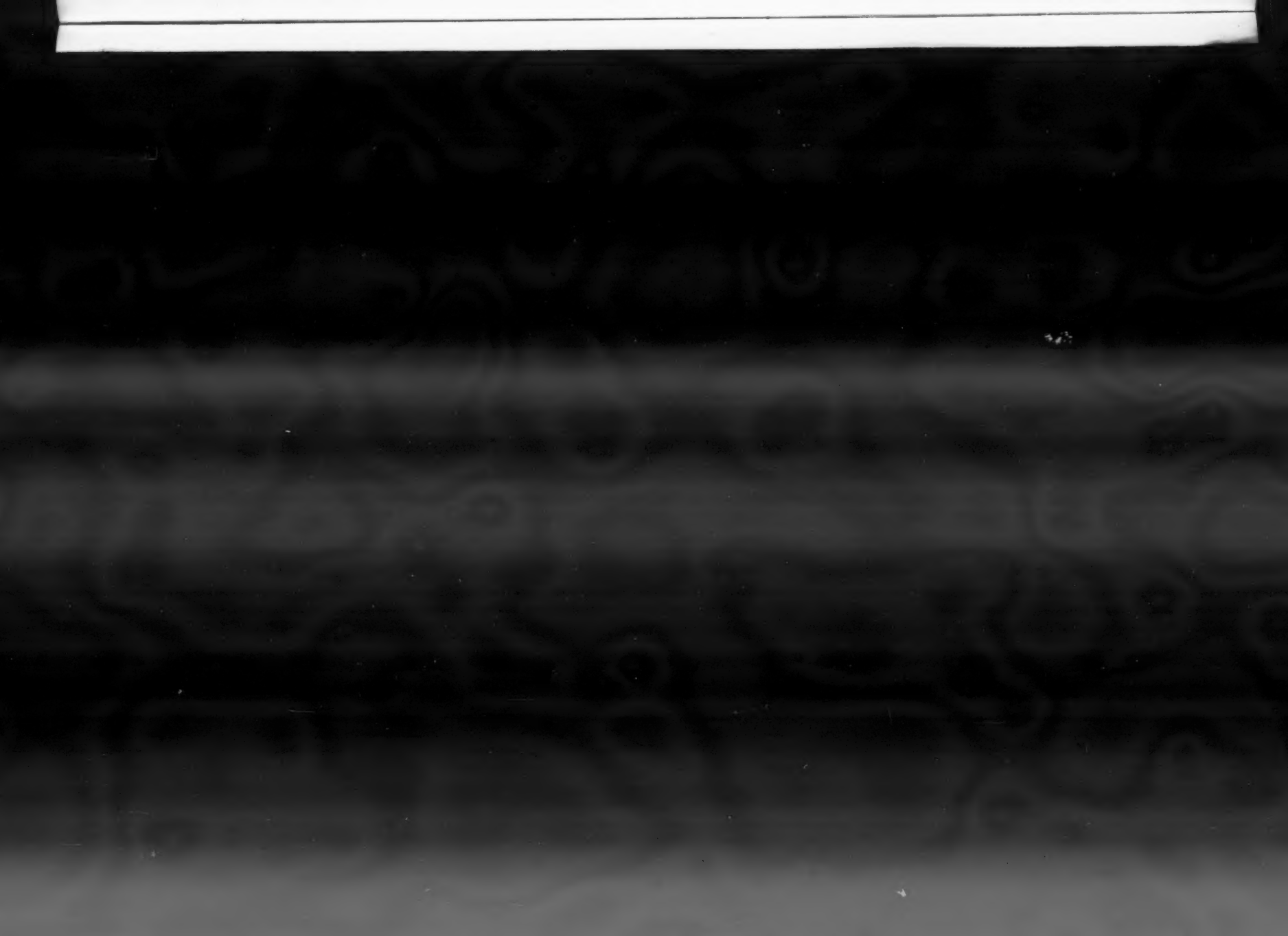


Plate I. Extensive parenchymatous tuberculosis.

Plate II. Arrested tuberculosis.

(The Management of Renal Tuberculosis — H. G. Bugbee.)



SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

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THE MANAGEMENT OF RENAL TUBERCULOSIS[1]

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NO more distressing condition is encountered in the realm of urology than that of renal tuberculosis. Insidious in its origin and early development how often this disease is allowed to go on, unrecognized, with its remissions and reappearances, until enough of the urinary tract has become involved to render a cure an impossibility. Only through the more careful study and analysis of urinary symptoms have we been able to demonstrate the frequent occurrence of this disease, to follow its progress, and to outline a method of treatment in each individual case.

To form the basis for certain remarks which I wish to make with regard to the diagnosis, pathology, and treatment of renal tuberculosis, I have selected five from a series of cases, operated upon by me, which demonstrate the different types most frequently encountered.

CASE 1. Male, age 34. For eight years had the patient suffered from frequent, burning urination and pain in the perineum at the end of urination. The symptoms were intermittent for five years, when remissions became less frequent. For the past three years the symptoms have been continuous, and the patient has lost weight and strength. In 1913 he began to void every half hour, with intense tenesmus. The urine was loaded with pus, there was some blood, and many tubercle bacilli. The bladder was contracted, retaining but one ounce of fluid; the mucous membrane was œdematous, especially about the left ureteral orifice, which was enlarged, rigid (golf-holed), and contained tubercles.

Urine from the left kidney contained pus, blood, tubercle bacilli, and showed a low urea output. Urine from the right kidney contained no blood, pus, or tubercle bacilli.

The left kidney, on removal (Plate I), showed almost entire destruction of the parenchyma, with abscess pockets, some of which contained a thick, putty-like substance, others a thin fluid.

Nephrectomy was done in 1913, and was followed by bladder symptoms for one year, with slow abatement. Two years later, the patient was free from symptoms.

CASE 2. Male, age 23. Three years ago the patient first noticed frequency of urination, which lasted one month, followed by remission for 4 months. This attack was relieved, but recurrences appeared from time to time. The last attack continued for three months. There were occasional attacks of pain in left lumbar region, followed by the passage of cloudy urine. The bladder appeared normal. Urine from left kidney was pale, it had a low specific gravity, low urea, contained few pus-cells, and no bacteria. Urine from the right kidney was normal.

Following ureteral catheterization, the patient passed a small phosphatic calculus with an attack of renal colic. The urinary symptoms recurred in two months. Ureteral catheterization revealed a few isolated tubercle bacilli in the urine from the left kidney.

The patient was given tonic treatment and urinary antiseptics for four months, with improvement of local symptoms and general health.

Nephrectomy in 1915 revealed a kidney, the upper pole of which (Plate II) was entirely destroyed, walled off, and contained no active tuberculous foci. The patient was out of the hospital in ten days, and has been perfectly well to date.

[1] Presented before the Central New York Medical Association at its annual meeting, Auburn, October 18, 1917.

CASE 3. Female, age 31. The symptoms were sudden in onset and lasted four months. They started with frequency, urgency, tenesmus, pain at the end of urination, and hæmaturia. These symptoms were continuous.

The bladder mucous membrane showed intense congestion and œdema about the left ureteral orifice. Urine from the left kidney was twice the amount from the right, alkaline, pale, contained pus, blood, and many tubercle bacilli. Urine from right kidney was normal. The lower end of the left ureter was palpable through the vaginal vault, thickened, and tender.

Nephrectomy in 1914, revealed a kidney of normal size, with several small ulcerations at the angle between the papilla and calyx (Plate III). Bladder symptoms were relieved in three weeks. Recovery was complete.

CASE 4. Male, age 21. Extreme kyphosis and lordosis from spinal tuberculosis were present. The tubercular lesion was apparently healed for six years. One month ago, there was sudden onset of frequent, painful urination, and hæmaturia.

The bladder mucous membrane was deeply congested about the left ureteral orifice. The urine from this kidney was abundant, cloudy from blood and pus, contained normal urea output, and numerous tubercle bacilli. Urine from the right kidney was normal.

Nephrectomy, twenty months ago, was accomplished with some difficulty, owing to the extreme deformity of the chest and abdomen. A small kidney of healthy appearance was removed, which, when sectioned (Plate IV), showed two small ulcerations at the angle between the papilla and calyx. Four months after the operation in this case, an epididymitis developed, which went on to suppuration, discharging on the surface. Bladder symptoms were relieved immediately following the removal of the kidney. The patient is well today.

CASE 5. Male, age 26. Six years ago the patient developed a pulmonary lesion. Six months later, without urinary symptoms, tubercle bacilli were found in the urine in the course of a complete physical examination.

Examination of the bladder showed a normal mucous membrane and ureteral orifice. Urine from the left kidney was double the amount from the right, pale, contained albumin, pus, blood-cells, tubercle bacilli, and a low urea output. Urine from the right kidney was normal.

The patient was treated by the open-air method until 1917. Repeated cystoscopic examinations and ureteral catheterizations revealed only a deficient left kidney function. No tubercle bacilli were found. For past two years patient has had repeated attacks of dull pain in left costovertebral angle, accompanied by gastro-intestinal symptoms which lasted two or three days, and which were relieved by a clearing out of the bowels.

Nephrectomy, three months ago, revealed a moderately enlarged kidney which, on section, showed numerous walled-off pockets (Plate V) containing a thin serous fluid. The patient is now living in the open and well.

The kidney removed in each of these cases showed the types of lesions encountered, i.e., true parenchymatous tuberculosis, with extensive destruction of renal tissue, as in Cases 1, 2, and 5, and apical tuberculosis or tuberculous pyelitis, as in Cases 3 and 4.

A knowledge of the pathology of renal tuberculosis is necessary to understand the clinical course of the disease and the proper management of the case.

Observations by Buerger (1), Keyes (2), Eisendrath (3), Braasch (4), Cabot (5) and others verify the fact that the tubercle bacilli gain access to the tissues by a process of filtration from the blood into the parenchyma and urinary tubules, and, instead of being excreted, are arrested, and the various pathological changes, such as infiltration, caseation, etc., begin. The bacilli usually lodge in the parenchyma, so that one sees cases in the early stage where the chief focus in which the typical infiltration and formation of cavities is seen, is associated with more or less nodular involvement of the entire parenchyma, or the bacilli may reach the surface of the papillæ or calyx recess, where they are amassed in sufficient numbers to bring about a tuberculous lesion.

As pointed out by Buerger (1), the angle between the papilla and calyx may afford a favorable nidus for the accumulation of bacteria, the anatomical disposition of the parts allowing poor drainage. This may result in ulceration, as in Cases 3 and 4.

As the infection spreads, more and more of the parenchyma undergoes changes typical of tuberculosis in other tissues, i.e., the formation of either granulation tissue, or of miliary tubercles, with subsequent caseation and the formation of larger or smaller cavities. In the early cases the cavities are filled with the typical cheesy débris, the result of the destruction of the kidney parenchyma, each cavity being limited by a capsule. In older cases the entire kidney is converted into a series of cavities, each containing a putty-like substance, the result of further changes in the caseous detritus. Not infrequently phos-

phatic deposits form on the walls of these cavities. The infection may remain limited to the kidney itself, or spread rapidly toward the capsule, later involving the tissues around the kidney, forming a perinephritic abscess or a fistulous tract which may open anywhere in the vicinity of the kidney.

If allowed to progress, an extension of the tuberculosis to all layers of the pelvis, to the ureters, and to the bladder takes place, upon the mucous surface of which tubercles form and ulcerate, while externally the process excites a peri-ureteritis, with irregular thickening of the ureteral wall. As a result of this ulceration and infiltration stricture formation takes place in the ureter.

Braasch (4) has emphasized, in connection with the pathology of tuberculosis of the kidney, the determining influence of strictures of the ureter, their situation, number, and character. Thus, if the first stricture lies near the bladder, a varying dilatation of the ureter above it and of the renal pelvis will necessarily follow, depending on the degree of the constriction. If the first stricture is in the upper ureter, there may be multiple strictures below it. If the ureter becomes closed early, a large pyonephrosis may result; if later, a caseated remnant of the kidney may remain.

Depending upon the general condition of the patient, a real effort is made to wall off the kidney process, leading toward a spontaneous cure. This effort was shown in Case 1, and was accomplished, as far as any active process was concerned, in Cases 2 and 5.

The symptoms of renal tuberculosis are almost entirely urinary, and are due to active pelvic, ureteral, and vesical lesions originating in ulceration of the primary renal focus into the renal calyx or pelvis, with the resultant discharge of tubercle bacilli into the urinary stream. The mere presence of a tuberculous lesion in the renal parenchyma causes no symptoms.

Frequent, painful urination is most often the first symptom, and is usually present so long as drainage of the renal focus is maintained. It is to be borne in mind, however, that frequency may be due to toxic nephritis on one side resulting from the absorption of poisons from the tuberculous kidney on the other side. In Case 5 there were no urinary symptoms.

The intermittent character of the urinary symptoms is thus seen to be due to the drainage of one cavity, followed by the absence of bacilli in the urine, the healing of secondary pelvic and vesical lesions and their recurrence when a second pocket breaks through, reinfecting pelvis, ureter, and bladder. This was noted in three of the cases.

Renal colic may result from the passing of blood-clots, cheesy débris, or phosphatic deposits, as in the second case. Autonephrectomy may occur from slow ureteral occlusion.

When the lesion is apical, the ulcerated area, being close to the pelvis or calyx, remains open, and the urinary symptoms are sudden in onset, severe, and apt to be ushered in with hæmaturia, as in Cases 3 and 4.

Pain in the loin may result from renal colic, renal distention, perinephritis, or dragging on a shortened and thickened ureter.

The general health of the individual usually shows progressive impairment, but remarkably good health may be maintained. Even when the active process has become arrested, as in Cases 2 and 5, the poor drainage of the cavities left by the kidney destruction will result in a mild periodic general toxæmia from absorption of retained secretion, as in Case 5.

Enlargement of the kidney may be appreciable, and tenderness may be noted, especially in the costovertebral angle.

From the foregoing pathological and symptomatological considerations, the importance as well as the difficulty of diagnosis of renal tuberculosis can be appreciated. Its presence should be suspected in any long-continued history of frequent, painful urination. With the perfection of cystoscopic technique it would seem that the diagnosis should be comparatively simple; but the intermittency of the drainage, the character of the pathological lesions present, when drainage of the kidney focus is maintained, i.e., a highly irritable bladder, which is distended with difficulty, œdema of the mucous membrane, which often obscures the ureteral orifice, or bladder lesions resulting in distortion, and finally ureteral stricture interfering with

catheterization, make the cystoscopic manipulation the most difficult of all conditions encountered, and often result in success only after time and extreme patience have been employed.

I am convinced that a positive diagnosis may be made in every case if one is willing to take the necessary time and care. The writer has seen the most unfortunate results from hasty diagnosis and proceeding with incomplete data. Repeated ureteral catheterization and a pyelogram may be necessary for a diagnosis in cases showing long remissions. Rest and internal medication should be given for a considerable period of time in order to allay the acute inflammation sufficiently to make the instrumentation possible, in those cases presenting severe symptoms.

By diagnosis I mean the detection of renal tuberculosis, its localization, and estimation of the separate kidney function. Physical examination is often of little value in making a diagnosis of renal tuberculosis. The lower end of a thickened, tender ureter may be palpated per rectum, and almost always through the vaginal vault. This examination should always be made. Cutting down on both kidneys and direct examination of each kidney may be necessary, and is advisable if other means fail. A case seen by the writer, in which ureteral catheterization was impossible owing to an obstruction in the lower end of each ureter, due to a crossing of the ureters after leaving the bladder (the left ureter going to the right kidney, and *vice versa*), in whom the better of the two kidneys was removed, might have been saved had this been done.

For more than thirty years after the recognition of tuberculosis of the kidney by Payr, in 1841, the treatment of this affection was confined to the domain of internal medicine. When Peters (6), in 1872, first performed nephrectomy in a case of tuberculosis of the kidney, the operation was a very rare one for any condition, as may be judged from the title of his article reporting the case. Quoting from the autopsy report, Peters says: "This condition is described by most writers as primary infiltrated tuberculosis of the genito-urinary organs." Despite the fatal outcome of this case, the treatment of tuberculosis of the kidney was gradually shifted from the field of medicine into that of surgery. So extensive had this change become in the next twenty years, that nephrectomy for tuberculosis of the kidney was pronounced "an error of the times" (7). "Men have been found," it was stated, "who would perform this operation."

Such warnings from the more conservative element of the medical profession did not serve to check the swinging of the pendulum in the direction of the surgical management of tuberculosis of the kidney, as may be judged from a partial review of the periodical literature for the past five years.

The status of the medical treatment of renal tuberculosis for the five years following the International Urological Congress, held in Paris, in 1908, was reviewed in 1913 (8), when the animated controversy regarding the mode of management of these cases was at its height. The results with the various non-surgical methods mentioned in this review (dietetic and hygienic measures; radiotherapy; heliotherapy; tuberculin treatment; treatment with the immunity bodies of Spengler, etc.), have not served, it will be seen, materially to alter the view that "nephrectomy, the sooner the better," is the method of choice in the presence of unilateral renal tuberculosis. For, as this reviewer states, operating surgeons, led by Albarran and Israel, are unanimous in demanding, under such circumstances, the early performance of nephrectomy.

Thus we find Morson (9) teaching his students at Middlesex Hospital, 1912, that "the 'watch and wait' treatment which is advocated by some surgeons only spells disaster and misery to the unfortunate patient." In bilateral renal tuberculosis, and in cases in which the disease is present elsewhere, he recommended conservative treatment, nephrectomy being confined to cases in which the disease is located in one kidney.

In this connection, too careful a study of the tuberculous patient cannot be made. Whether tuberculosis of the kidney is a primary lesion is still a question, and a thorough search should be made for active or latent foci in other parts of the body.

Plate III. Tuberculous pyelitis.

Plate IV. Tuberculous pyelitis.

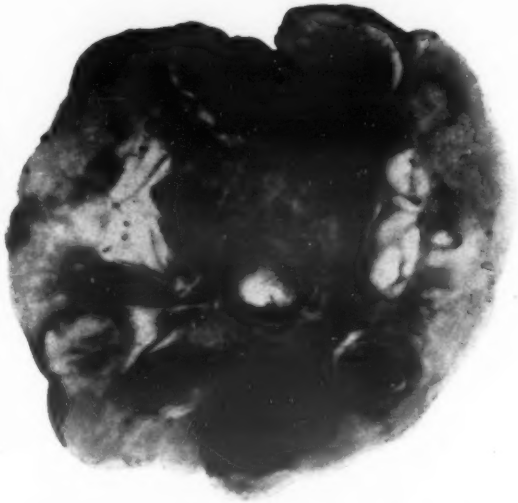

Plate V. Parenchymatous tuberculosis. No active foci.

(*The Management of Renal Tuberculosis — H. G. Bugbee.*)

The recognition of such foci is most important in outlining a plan of treatment for renal tuberculosis. I have seen a general miliary tuberculosis light up after nephrectomy in three cases, and latent foci appear in the lungs, lymph-nodes, and epididymis in many others.

This leads the writer to advise the placing of the patient in the best possible condition before operation, by rest, nourishing diet, tonics, increasing elimination, the administration of a non-irritating urinary antiseptic; the adoption of an operative technique by which the kidney is removed as rapidly and with as little traumatism as possible; the destruction of foci in the ureter by injecting pure carbolic acid; anchoring the ureter in the lower angle of the wound; closure of the wound; and again treating the patient for a prolonged period as a case of pulmonary tuberculosis would be treated.

If this procedure is followed, the patient will come to operation with more bodily resistance, the operation will take less of his vitality, and dissemination of the disease following operation will be less likely to take place. This point is well demonstrated by the second and fifth cases reported. The active disease was arrested in these cases, and the nephrectomy was attended by no more reaction than would have accompanied the removal of a cyst.

In inoperable bilateral renal tuberculosis it is surprising to see how much may be accomplished by general hygienic treatment. A most striking case of this class was seen by the writer six years ago. The patient, a man of 28, presented an advanced tuberculosis of both kidneys and bladder, with extensive destruction of kidney tissue, as shown by functional tests. His symptoms were most distressing. The passage, every fifteen minutes, of thick, bloody urine, was accompanied by great tenesmus. His general condition was bad. He was sent to the mountains to be treated as a case of general tuberculosis, and given santalol to relieve his urinary distress. The patient is now alive, in very fair general health, his urinary symptoms are slight, retention of urine for three or four hours is often possible, and he is able to follow his profession, which, fortunately, is that of a writer, requiring no physical exertion.

The tuberculous patient is to be regarded as one who must use every atom of his physical force to limit the activity of the tubercle bacilli. Anything which uses up this fighting force, be it due to the activity on the part of the patient or to the reaction resulting from treatment, must have a deleterious effect. This must be continuously borne in mind in preparing patients for operation, in following them after operation, and in treating inoperable cases. The writer is convinced that many cases of tuberculosis of the lower urinary tract, epididymitis, prostatitis, and vesiculitis, appearing after nephrectomy, could have been prevented had this fact been borne in mind.

In this connection a note should be made with regard to the administration of tuberculin. Much has been said for and against its use, laterly mostly against it. It seems to me that tuberculin is often beneficial, if given in such small doses, so slowly increased, that a reaction is obtained which is not sufficiently pronounced to lower the patient's resistance. So often the efforts of nature are not properly gauged, and in attempting to hasten the progress, the feeble, but constantly increasing, assistance is lost, and the treatment is condemned and cast aside.

Bernard and Heitz-Boyer (10), upon the basis of their findings, maintain that, with the exception of those cases in which nephrectomy is not possible, the treatment of renal tuberculosis consists in the removal of the diseased kidney, as soon as the diagnosis is established. In cases of uncomplicated unilateral renal tuberculosis they hold that nephrectomy is indicated, not only as a last resort, but as an early and adequate measure. Nephrectomy alone can cure the patient completely and reliably. Its early performance increases the prospects of obtaining such a cure, protecting the patient against vesical complications, recurrence in the other kidney, tuberculous generalization, etc., more effectually than when it is done late or omitted altogether. Tuberculin treatment, in the opinion of these authors, has no place in the

treatment of unilateral renal tuberculosis, not even after nephrectomy.

Parkinson (11), in presenting a case before the Royal Society of Medicine, 1913, expressed himself as inclined not to operate, inasmuch as the kidney had shrunk so much under medical treatment, and the patient, a boy of eight years, had gained in weight. He asked for an expression of opinion from those present, and was advised to operate, one member suggesting preliminary treatment with tuberculin.

Braasch (4), summarizing the results of operation in 203 cases of renal tuberculosis, says:

Six (2.9 per cent) of the 203 patients operated on died in the hospital. Excluding the cases of those patients operated on during the past year as being too recent to be of statistical value, we were able to obtain the subsequent histories of but 70 per cent of the patients. Of this number, 18 per cent were reported dead. Of this 18 per cent, 60 per cent died during the first year after operation, and 15 per cent lived more than three years. Of the 82 per cent alive, all but 13 per cent reported improvement on recovery from their previous bladder symptoms. The majority of those reporting no bladder improvement had gained in weight and strength.

The length of time elapsing before the bladder symptoms were relieved varied from a few weeks to five years after operation, 67 per cent in less than a year. Seventy-five per cent of those patients reporting no improvement in their bladder symptoms gave a history of bladder infection of more than two years' standing. The operative wound was reported healed in less than three months by 43 per cent of the patients, and in less than a year by 87 per cent. The sinus persisted as long as four years in one case. . . . Ureterectomy did not seem to affect the after-course materially. In the fourteen patients in whom ureterectomy was done with the nephrectomy, the sinus persisted fully as long as in the others.

Of five patients in whom the diagnosis of bilateral tuberculosis was made and substantiated on exploration, and in whom the more diseased kidney was removed, all were reported dead within a year after operation. While our results in operating for bilateral tuberculosis are not so satisfactory as those noted by some observers, the operation may occasionally be followed by cure.

Operative mortality is, therefore, a negligible factor in nephrectomy for renal tuberculosis. We can expect a permanent cure in fully 75 per cent of patients operated on. On the other hand, if otherwise treated, fully 90 per cent must eventually succumb to the infection and in taking the small chance for such a cure the risk of infecting the bladder in other foci is greatly increased.

Braasch (12), in another communication of the same year, gives the following reasons for delay in seeking surgical relief for renal tuberculosis:

(1) The true nature of the disease still too frequently remains unrecognized by the general practitioner; (2) it is not generally known that surgery is the best means to cure tuberculosis of the urogenital tract; (3) there exists a widespread belief that renal tuberculosis can frequently be cured by means other than surgery, particularly through the use of tuberculin. . . . While it may be true that incipient renal tuberculosis may occasionally recover spontaneously, it has been our experience that such a case is so exceptional that it must not be relied upon.

Of 283 cases (up to January 1, 1912) diagnosed as renal tuberculosis, Braasch continues:

Two hundred and twelve patients have been operated upon, leaving 71 who were not operated upon. Of those not operated upon, we were able to trace 48. Ten patients were reported alive; 2 between five and ten years, 4 more than one year. Of this number, we have found but 3 in whom the tubercle bacillus has disappeared from the urine and in whom the vesical symptoms have ceased. Two of these cases are of less than five years' duration and the third is of eight years' duration. It is of interest to note that the three patients were young adults, less than twenty years of age, in whom the progress of the disease is usually more rapid than in patients above forty. There are left then 38 patients who are known to have died, or a non-operative mortality of 80 per cent. . . . Of those regarded as inoperable, our records show 26 patients in whom both kidneys were infected. Twenty of these gave a distinct history of infection in the second kidney from two to ten years after the first kidney became diseased. Although we advised twelve of the latter to try tuberculin, all with one exception have since died.

Rovsing (13) expresses the following very positive opinion regarding the treatment of this disease:

In recent years, the conception of the prognosis has become so optimistic that several authors maintain that early cases of kidney tuberculosis ought to be treated conservatively—by dietetic measures and with tuberculin — while nephrectomy should be allowed only in very advanced unilateral cases.

In my opinion this doctrine is wrong and very dangerous. First, because we never know whether the case is early or advanced, malign or benign.

Behind the slightest, most veiled symptoms the most advanced, the most malignant tuberculosis may be hid, as recently proved by some of my cases. Second, there exists no convincing case of tuberculous kidney cured by conservative treatment. As now the statistics have established that we, by nephrectomy, can save 75 per cent of all patients operated on, it seems quite clear that nephrectomy is indicated as soon as we have diagnosed a unilateral kidney tuberculosis. In spending the time on conservative treatment you run the risk of spreading the tuberculosis to the bladder and to the other kidney, and thereby destroy the possibility of a radical cure.

Eisendrath (3), from a study of nearly fifteen hundred cases operated on, including a number of his own, concludes that, in unilateral renal tuberculosis, the operative mortality, in the early months of the disease, is only a little over 2 per cent, and that the late or remote mortality (first five years) is not much higher. "Even in the latter," he holds, "the mortality is far less than it would have been if the condition had remained unrecognized or not subjected to operation." He further concludes that "no authentic case of tuberculosis of the kidney exists, which has recovered under similar, i.e., non-operative treatment, without complete loss of function of the kidney."

Kapsammer (14), in an extensive discussion of renal tuberculosis from various points of view, makes the statement:

The operative therapy is the only rational treatment that can be considered at the present day in tuberculosis of the kidney. . . . We know today that in primary tuberculosis of the kidney which, as a rule, is unilateral, a nephrectomy brings about a definite cure, as long as the other kidney is healthy. We also know that when lesions occur in the other kidney, an operation on the diseased kidney is not so definite in its results, as far as a cure is concerned, but we do not know under what conditions lesions in the other kidney remain in abeyance. Therefore, it follows, that when a diagnosis of the existence of a tuberculosis of the kidney on one side has been established, that fact forms an indication for an operation and the removal of the diseased kidney.

Keyes (2) in discussing two cases which had remained entirely without symptoms for two and six years, respectively, at the end of which periods the symptoms returned, and nephrectomy was performed, says: "As we look at these two specimens, I think we may anticipate the day when specimens similar to these shall be made the basis of a plausible but entirely unwarrantable pathological attack upon nephrectomy for the cure of renal tuberculosis."

Renton (15) in giving some case reports, with comments, adds his opinion to the list of those who hold that if one is sure the disease is renal, that it is unilateral, and that the other kidney is healthy, nephrectomy, "the earlier the better," is indicated.

Cabot (5), introducing a study of end-results made by Crabtree, says:

The tendency to watchful waiting which was generally but another name for medical procrastination, has considerably abated and there is practically no difference of opinion, among those qualified to express one, that in unilateral renal tuberculosis operation offers the only chance of cure and the so-called medical treatment only prolongs the agony. . . . The scientific world is waiting for proved cases of renal tuberculosis healed permanently, except by removal of the kidney, either by nature or by art.

Kilbane (16) states unequivocally that "nephrectomy is the logical treatment for uncomplicated unilateral cases, as soon as a diagnosis is possible."

Cabot and Crabtree (17), in another study of renal tuberculosis, among other renal infections, state that "cure results only by removal of the whole kidney, either by nature (caseation) or by art (nephrectomy)." They purposely omit a consideration of the treatment of renal tuberculosis, "because it consists wholly in the removal of the kidney when the diagnosis has been made."

Dock (18), closes his contribution to a symposium on tuberculosis of the kidney with the laconic statement: "Extirpation of the affected kidney is at present conservative treatment." His views concerning the possibility of spontaneous healing in this disease will be discussed later.

From the foregoing opinions, selected from the writings of a representative list of surgeons and urologists, it may be judged that the observers quoted advocate the taking of no chances on the basis of the possibility of the spontaneous healing of the tuberculous kidney, and little more on the

ground of possible improvement under non-surgical treatment.

Heitz-Boyer (19), for example, warns against accepting the so-called "spontaneous cure" of a tuberculous kidney—which consists in an exclusion of the diseased kidney—as a curative process in the true sense of the term. A tuberculous focus cannot remain in the body for years without causing harm. Aside from the fact that the process of seclusion itself favors the lodging of tubercle bacilli in the other kidney, an important pathological part is played by the stenosis of the efferent urinary passages, which precedes the exclusion of the kidney, and results in stagnation.

There are cases, this observer states, in which absolutely clear urine is secreted, by means of ureteral catheterization, from a kidney known to have been positively tuberculous in the past. Such cases serve as an argument in favor of the view that internal treatment, i.e., specific treatment, is capable of curing renal tuberculosis with preservation of the renal function. These cases, he points out, are very exceptional, however. Among 150 cases collected in a circular inquiry, together with Bernard, Heitz-Boyer found only one case in which clear urine was voided from a previously tuberculous kidney, after its treatment with tuberculin. Similar observations have been made by other investigators. According to the findings of Heitz-Boyer, in anatomical preparations, these cases do not represent a cure of the diseased portions, but a seclusion of these from the remaining healthy part of the kidney parenchyma. The rarest of all communication between the tuberculous focus and the renal pelvis leads to the appearance of clear urine, secreted by the healthy remnant. A regional, partial development of renal tuberculosis, and the resulting partial seclusion, which may concern one or more renal segments up to half of the kidney, may in rare cases lead to a condition which can be interpreted as a cure with preserved function. However, this is not really a cure, he warns, but a partial elimination of the organ. Meanwhile, the closed pathological foci represent a constant and serious danger for the patient, so that even the apparently most conclusive and best supported results obtained by conservative treatment, possess only a very doubtful value. The process of exclusion of a tuberculous kidney, while it explains the retrogression of the urinary disturbances, cannot be regarded as a curative process in the real sense of the term.

These remarks are well illustrated by Cases 2 and 5, cited above.

Harbitz (20) expresses a more positive view regarding the possibility of spontaneous healing, which he considers a not uncommon occurrence. In autopsies, he states, it is not uncommon to find evidence of a slow spontaneous cure, in the form of completely encapsulated lesions of the kidney, which are first discovered as accidental post-mortem findings. In many of these cases the renal tuberculosis has taken a chronic course (four to twenty years, in this author's material).

Sometimes, according to Harbitz, there is a picture of a "sclerotic" inflammation, the fibrous transformation and healing tendency preponderating so markedly that it is very difficult, if not impossible, to decide from the macroscopical appearance whether a tuberculous inflammation is present or not. In other cases, there is a completely encapsulated chronic renal tuberculosis, where the inflammation has been arrested and the discharge of pus through the ureter has stopped. The cure may be so complete that a tuberculous inflammation in the remnants of renal tissue can be demonstrated only on careful microscopical examination (as in Cases 2 and 5 cited above). In still other cases, even the microscopical evidence is missing, as in one of Harbitz' cases, and the diagnosis of renal tuberculosis being cured by encapsulation can be rendered only on the basis of the entire macroscopical picture and the remaining autopsy findings.

Morris (21) asks the question "How often do patients recover spontaneously from tuberculosis of the kidney?" which forms the title of a contribution in connection with a case in which treatment for increasing resistance seemingly produced a cure. This case recalled to his mind some experiments

of his, a number of years ago, planned with the idea of determining if tuberculosis of the kidney could be brought to a stop by ligating the renal artery for the purpose of limiting nutrition, or by ligating the renal vein for the purpose of causing hyperæmia, in order to obtain an effect in line with the work of Bier. Rabbits were injected with virulent cultures of test-tube culture human tubercle bacilli, the injections being made directly into the parenchyma of the kidney in some rabbits, and simply beneath the fibrous capsule in others. The abdomen was opened in about a month, when the tuberculosis was found well under way, and closed again for further development before ligating the renal arteries and veins. Not being able to follow the experiments again promptly, it was noted that rabbits which had shown various signs of illness were getting better. When the abdomens were finally opened (it is not stated how long after the commencement of the experiments), the tuberculosis had come to an end in some cases and nearly to an end in others. The rabbits finally recovered completely. "If these rabbits," comments Morris, "depending upon their own resources, allowed tuberculosis to get well under way, and then placed it under control with their own factors of protection, it is a question if some of our patients with tuberculosis of the kidney will not be quite amenable to those resources which increase the general resistance of the patient."

O'Neil and Hawes (22) in line with this view, hold that "careful and constant supervision prior to any surgical procedure will vastly increase the benefit of such procedure and that this is particularly true in urinary and genital tuberculosis."

Dock (18) says, regarding the possibility of spontaneous healing: "The question in renal tuberculosis is important because if spontaneous healing is not probable in general, medical treatment, no matter how complete, is at present less promising than extirpation, if extirpation is possible."

Young (23) who followed Dock in the symposium on renal tuberculosis, said: "None of the reported cases on close examination fulfill all of the requirements necessary to establish definitely the proof of a cure, and many of them do not have all of the data possible to obtain during life."

Referring to the immunizing treatment advocated by many, Young says:

> If we reverse this evidence we find in it a very strong suggestion that there is no process going on in the body in this disease which has any marked tendency to cause healing, or else the immunizing process would not be necessary. . . . This seems to me to be the keystone to the whole question. If a person has a strong natural immunity to start with, an initial infection will not gain a foothold. If a process does start in the kidney, the slow course of the formation of antibodies in comparison with the spread of the lesion allows the disease to get beyond the point where it can be entirely obliterated, although it can often be walled off so efficiently that the symptoms cease and the condition becomes latent but capable of further mischief if for any reason it gets loose.

From a study of the cases reported in the literature, from pathological study, and from reasoning in connection with immunization, Young concludes that "the healing of a tuberculous focus in the kidney is impossible."

The foregoing rather extensive review of the literature on renal tuberculosis for the past five years has been made, and exact quotations taken from the various writers, in order that a present-day analysis might be made of this important disease and its proper management.

The past five years represent the highest development in urological progress, due largely to the accurate study of cases, the placing of urology on a par with other specialties, and the closer association of the urologist with those in other branches of medicine and surgery.

The observations of the writer, from his own cases and those studied in conjunction with others, coincides, in the main, with the opinions of the writers who have contributed to the subject during the past few years.

CONCLUSIONS

The present status of renal tuberculosis may be summarized as follows:

1. Renal tuberculosis may be a primary lesion and arises from a filtration of tubercle bacilli from the blood stream into the parenchyma or tubules of the kidney, where tissue

changes similar to those found in tuberculous foci in other parts of the body, take place.

2. An effort is always made to wall off the process, but the formation of antibodies is so slow, and the immunity of the patient, which may have always been absent or which may have been temporarily diminished, is so low that the lesion usually gets beyond control, and usually goes on to wide destruction of the kidney and extension to the other kidney, to other parts of the urinary tract and of the body.

3. From the nature of the lesion, remissions are common.

4. The symptoms of renal tuberculosis are misleading, often slight at the onset, and give no indication of the extent of the lesion.

5. The diagnosis of renal tuberculosis may be simple or the most difficult of all urinary lesions, often requiring preliminary treatment to allay acute symptoms and repeated cystoscopic examinations over a long period of time.

6. The treatment cannot be outlined from a study of the symptoms. The remission of symptoms, often for long periods of time, should not be accepted as a cure.

7. The effort on the part of nature to inhibit the progress of the disease and to limit the lesion should be borne in mind, utilized and encouraged in every possible manner in inoperable cases, as well as before and after operation.

8. While this review shows that many others have had cases similar to two of the writer's, where the active tuberculous process has been arrested and walled off, still this is not the rule, the lesion being progressive. Even when arrested, a kidney the site of poorly drained cavities is a menace to the system. Therefore, nephrectomy for unilateral renal tuberculosis is the proper treatment.

9. With the means at hand by which we can often make an early and accurate diagnosis of renal tuberculosis, and with our statistics showing that 75 per cent of the cases of unilateral infections are cured by nephrectomy, the tendency is to be too optimistic as to the future in these cases. They should all report regularly, be watched and treated as cases of general tuberculosis.

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PEPTIC ULCER[1]

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THERE is probably no subject that is more frequently discussed at gatherings of this kind than that of peptic ulcer and there is probably also none in which discussion has proved more valuable and instructive. Nevertheless there is still lacking a definite knowledge of the underlying causes and the mechanism of the development of these ulcers and unanimity as to the best method of treatment once they have occurred. I have on so many occasions emphasized my conviction that the basic factor in the development of peptic ulcer is infection that it seems almost superfluous to further insist upon it. The toxæmic origin of peptic ulcer is generally recognized and there seems little doubt that infection is the primary cause of the toxæmia in the vast majority of cases. Furthermore, clinical experience in recent years is indicating more and more clearly that the original site of the infection lies in the vermiform appendix, and Rosenow's demonstration of the elective localization of micro-organisms, especially streptococci, is additional confirmation of the infectious origin of these ulcers and similar lesions. Indeed, Rosenow's studies show that the cells of the tissues for which a given strain of bacteria shows an elective affinity may "take bacteria out of the circulation as if by a magnet — absorption." From Bolton's careful histological studies, we learn that the initial lesions which give rise to ulcer of the stomach are localized necrosis of the mucous membrane, localized hæmorrhage and inflammation of the lymphatic follicles. The common cause of necrosis is bacterial infection or its toxins circulating in the blood stream and, as pointed out by Bolton, the cells of the gastric mucosa being primarily attacked by the poisons in the circulation, necrosis is readily produced by the local action of the gastric juice. Necrosis may arise in this way without any preceding hæmorrhage or lymphatic inflammation, but hæmorrhage is an actual and frequent cause of ulcer and is likewise due to bacterial toxins circulating in the blood stream, which, destroying the endothelial cells of the capillaries, pave the way for the local destructive action of the gastric juice. Finally, inflammation of one or more of the lymphatic follicles, so thickly studded along the lesser curvature of the stomach especially toward the pylorus, may give rise to a submucous abscess which by rupture into the gastric cavity allows the juice to act on the base of the ulceration thus exposed.

Ulcers developing in one or the other of the processes mentioned would heal in a normal stomach, but being constantly exposed to the action of the frequently hyperacid gastric juice they show a tendency to spread rather than to heal and sudden perforation or hæmorrhage is often the first indication of gastric ulcer. Or in cases of simple ulcer the tendency is to become callous with chronic peptic ulcer as the result. There is little doubt that every chronic peptic ulcer was at one time acute and began in one of the aforementioned processes.

If the early symptoms are sufficiently pronounced as to demand and *receive* attention the ulcer may heal, but owing to their insidious character these ulcers do not, as a rule, present early definite symptoms, and the longer they remain unhealed, especially if situated on the lesser curvature near the pylorus, the less amenable are they to medical treatment. In fact, it is doubtful whether a true peptic ulcer, as distinguished from an erosion, ever heals under purely medical treatment. The so-called cures represent a latency which, there is no telling how soon, is apt to be aroused to activity. It is, of course, rather difficult exactly to estimate the relative proportion of medical and surgical cures of peptic ulcers. But we do know, as Coffey[2] aptly remarks, that every case that comes to the operating table represents a medical failure and perhaps several failures on the same individual. The frequency of such failures is readily seen by the increasing number of cases operated on that are reported from the larger hospitals throughout the country. In

[2] Surg., Gynec. & Obst., 1917, xxiv, 350.

[1] Read before the College of Physicians, Philadelphia, March 6, 1918.

my own experience I have operated on 73 peptic ulcers during the year just passed; compared with 60 during the year 1916, an increase of 18 per cent. There is, to be sure, no way of telling whether this increase is the result of a wiser counsel prevailing among internists as a consequence of the more or less forcible arguments presented by the revelations of the operating theater as to the better method of treating peptic ulcers, or whether it is due to an actual increase in the incidence of this form of gastro-intestinal disturbance as the result of modern living conditions. To attribute it to a combination of the two factors would probably provide unction for both the surgeon and the internist. Be this as it may, there is little doubt that the improved diagnostic aids at our disposal have to a large extent led to a greater degree of certainty in diagnosing the presence of deformities and functional derangement of the gastro-intestinal tract, for the greater number of which surgery is the only rational treatment. With the aid of the X-ray and the various clinical tests, and a carefully taken history, a correct pre-operative diagnosis of ulcer has been made in 88 per cent of our cases during the past year.

As it is, we surgeons are free to confess that we have not yet attained the ideal of 100 per cent of cures by our methods. We are still being confronted with a sufficient percentage of recurrence of symptoms after operation to keep us humble, even though we can claim that from 75 to 90 per cent of operated cases are either completely cured or so greatly benefited as to require no further medical treatment. Of our patients operated on for peptic ulcers during the past 18 months, 90 per cent of those traced reported complete cures.

Recurrences indicate primarily that a certain number of cases have by operation been merely placed in a *status quo ante* as to their liability to develop peptic ulcer, and secondarily some fault in the method of operation.

For a chronic ulcer of the duodenum we believe that excision of the ulcer is the best method of treatment. If the ulcer is easily accessible, which it usually is if located on the anterior or outer wall of the bowel, its complete removal by excision presents no difficulty. But where there is marked and extensive induration, complete excision of an ulcer is not always an easy operation, indeed, it may be a dangerous one except in the hands of the experienced abdominal surgeon. The occasional operator in such a case had better content himself with a gastrojejunostomy. For a time it was our practice in treating ulcers located low down on the duodenum to excise the ulcer and implant the duodenal stump into the head of the pancreas. But our experience has been that in two instances the digestive action of the pancreatic juice has resulted in the formation of duodenal fistulæ necessitating a secondary operation. We have therefore abandoned the practice and in such cases we now do nothing to the ulcer, but infold the wall of the duodenum and adjacent gastrocolic and gastrohepatic omentum over the ulcer and make a gastrojejunostomy. The latter procedure, in fact, is considered by Moynihan and others as of itself sufficient for the cure of duodenal ulcer. While we consider it an integral part of the treatment of all ulcers of the duodenum, we believe that the surgeon's first effort should be directed toward the removal of the diseased area, and that gastrojejunostomy as a supplemental operation though generally effective in preventing a recurrence cannot always be relied on of itself to cure a fully developed chronic ulcer.

Not only is it necessary to treat the ulcer at the time of operation, but it is equally important to endeavor to discover the focus of intra-abdominal infection that is the real offender in the case. It is, therefore, essential to inspect the biliary tract and drain or remove the gall-bladder, according to existing conditions; the frequency of an accompanying pancreatitis should be borne in mind in this connection. In our cases during 1917 we found disease of the biliary passage present in 16.3 per cent of chronic peptic ulcers.

Above all we should not omit the removal (unless contra-indicated, which is rarely the case) of the appendix, that obnoxious organ which is the most constant source of intra-abdominal infection. We are fully in accord with Moynihan when he says that the com-

monest site of gastric ulcer is in the right iliac fossa, and that "in the majority of cases in which the most erudite teaching of the most astute German physician would justify or compel a diagnosis of ulcer, the patient is often suffering from a lesion elsewhere and more often than not in the appendix." The appendix can be removed either through the same incision as that used for the exposure of the upper abdomen or through a separate McBurney incision. We prefer the latter method.

Excision of a gastric ulcer would be as desirable as it is for ulcer of the duodenum were it always as safe and always feasible. While we consider it best suited for ulcers located at some distance from the pylorus, we do not hesitate to say that it should be the operation of first choice in indurated ulcers, irrespective of location, that is to say, pylorectomy or partial gastrectomy for pyloric ulcers, wedge-shaped or circular resection of ulcers on the lesser curvature, for ulcers on the posterior wall, transgastric resection or resection by way of the entero-colo-epiploic route. By this same route ulcers on the posterior wall of the duodenum adherent to the pancreas, with few exceptions, are rendered accessible and amenable to excision.. We would add, however, that a conservative selection of cases is essential, and excision should be attempted only in the absence of encumbering adhesions and where the patient seems able to withstand what often proves to be a rather tedious operation.

Ulcers on the posterior wall of the stomach invading the coats are best exposed and disposed of by dissecting the gastrocolic omentum from the transverse mesocolon, lifting up the great omentum, when the entire posterior wall of the stomach may be beautifully shown, also the duodenum and pancreas. This exposure very materially facillitates access to ulcers that otherwise would be difficult to deal with.

Destruction of an ulcer by actual cautery is a method originated by Balfour at the Mayo Clinic where it has been done with marked success. We have had no experience with this method of treating gastric ulcers.

A careful selection of cases is also essential for the success of pyloroplasty, as advocated by Finney.[1] While in his hands the immediate mortality has been lower than for gastrojejunostomy (5 and 7 per cent respectively), this is not the experience of most surgeons. Finney also reports better end-results from his operation than from gastrojejunostomy (93 and 94 per cent cures, respectively). We believe that Finney's method of pyloroplasty should be employed only where gastric motility is good, where perigastritis is absent, and where the pylorus is not involved in cicatricial tissues. As there are few cases presenting these favorable conditions, the operation would have only a limited application. Adhesions are nature's safeguard and should be treated with respect. In not a few instances adhesions represent barriers guarding a threatening perforation or an area of a previous chronic or subacute perforation. Injudicious destruction of such adhesions may open up a perforation into the stomach, which may not be amenable to closure by suture, and will also subject the patient to the risk of septic peritonitis from the unexpected and sometimes undiscovered extravasation of gastric contents. The safer course, we believe, is to do a gastrojejunostomy in a healthy stomach wall and let nature's barrier remain undisturbed. The more marked the pyloric stenosis the more certain are the benefits to be expected from gastrojejunostomy; furthermore, where the pylorus is much obstructed it is also involved in cicatricial tissue, an extremely unsuitable site for incision and suture. Stitches, as we all know, do not hold well in scar tissue, nor does it lend itself so well to an anastomotic operation as does normal tissue, both because of its rigidity and its lack of blood supply. Still, where the pylorus is an obstructive factor without being ulcerated or the seat of cicatricial tissue Finney's operation may prove of value.

On the other hand, gastrojejunostomy has been proved by clinical experience, the best standard of success, as admirably fulfilling the surgical requirements for the treatment of gastric ulcer. The death rate is low, collected statistics place it at not more than 10 per cent, and in the hands of some surgeons it is

[1] Am. J. M. Sc., 1915, cl, 469.

negligible. There were no deaths in our cases of gastric ulcer operated on in 1916 and 1917 treated with posterior gastro-enterostomy as a combined or as the only operation. The end-results also of the operation in the treatment of pyloric ulcers, where there is no pyloric obstruction, are most satisfactory. While it is not always the best procedure for all ulcers located elsewhere in the stomach, it is even in these undoubtedly the least dangerous and the most generally applicable operation in the hands of those who are not doing many operations for excision. If the anastomosis is made not in the fundus of the stomach but in the pyloric antrum, the anastomotic opening will functionate even when the pylorus is patulous, and even though the gastric contents do not leave the stomach through the new opening but are still being discharged through the pylorus, gastrojejunostomy is a curative measure for the ulcer, inasmuch as it reduces hyperacidity by permitting the admixture of the bile and pancreatic juices with the stomach contents.

The question of exclusion of the pylorus as an aid to gastro-enterostomy in the cure of gastric ulcers is still a matter of discussion. We believe that the only theory on which it can be held of value as a primary operation is that which teaches that gastro-enterostomy is of benefit not because (as has been hitherto considered its most desirable effect) it admits an excess of alkaline duodenal secretion to the stomach, but by merely accelerating the evacuation of the stomach it lessens the time during which peptic corrosion of the ulcer can take place. Sippy[1] supports this view arguing that pepsin acts only in acid medium, and as the acidity of the gastric juice depends largely on the presence of food in the stomach, the only good gastro-enterostomy can do is to accelerate the evacuation of food from the stomach; as long as the pylorus is even partially open, little or no gastric contents will pass by way of the new opening, and it is therefore of little value; but if the pylorus is occluded (by stenosis from ulceration or by ligation or plication, etc.) then the new opening serves for evacuating the stomach and does so in less than the normal time. We believe that Sippy overlooks the fact that in duodenal ulcer the stomach is often emptied through the pylorus in less than the normal time, and nevertheless the addition of a gastrojejunostomy promotes the healing of the ulcer without further accelerating the evacuation time. The only reasonable conclusions thus, it seems to us, is that the value of gastro-enterostomy lies in the increased alkalinity of the gastric contents obtained by admitting to the stomach through the anastomotic opening the alkaline duodenal secretions. Therefore, it seems doubtful whether primary occlusion of the pylorus is of any value.

[1] Sippy. J. Am. M. Ass., 1915, lxiv, 1625.

Vicious circle following gastro-enterostomy is a very unusual occurrence in these days, but so-called marginal ulcers developing around the gastro-enterostomy opening are, unfortunately, still being recorded, although the percentage of cases is small. During the past two years we have had occasion to treat four marginal ulcers. In two instances the original operation had been performed by us at the Lankenau (formerly the German) Hospital of Philadelphia. The histories of these two cases follow:

M. D., female, age 47. Operated on April, 1907, for gastric ulcer, hour-glass stomach, cholelithiasis. Operation consisted of gastrogastrostomy, posterior gastro-enterostomy, and cholecystostomy. Recovery was interrupted by phlebitis. The patient was well until January, 1915, when she suffered a severe attack of sharp epigastric pain which came on immediately after eating. There was nausea but no spontaneous vomiting. Relief was obtained by self-induced vomiting. Several similar attacks followed this one but none was so severe as the first one. She also gave a history of occasional hunger pain relieved by food. The bowels were costive; stools dark. Occasional dry cough. Loss of weight 13 pounds in four weeks.

Operation, April 17, 1916. The stomach was exposed, and the adhesions around latter were separated. The old gastro-enterostomy opening was patulous. Subtotal gastrectomy was done with Roux-Y anastomosis. Recovery.

There was no reply to the inquiry sent concerning the ultimate result of the operation.

H. A., male, age 28. Operated on April, 1915. An ulcer was found on the second part of the duodenum. The duodenum was plicated over the ulcer after which a gastrojejunostomy was done. The appendix was removed through a McBurney incision. It contained many fæcal concretions. Uneventful recovery.

The patient was well four months when periodic attacks of epigastric pain returned. The pain was cramp-like but not severe and had no definite relation to eating. No nausea and no vomiting. The patient was re-admitted to the hospital, February 2, 1917. About eighteen hours before admission she was seized with a severe attack of pain. Examination showed slight rigidity and distention of the abdomen; peristalsis was present. X-ray examination revealed partial constriction at the gastro-enterostomy opening. At operation, February 8, 1917, the margin of the gastro-enterostomy opening was found indurated, and an ulcer presented at one centimeter on its upper border. The duodenum was patulous. A section of the stomach with the jejunum comprising the former anastomosis was excised, the opening in the stomach closed, and a new Roux-Y anastomosis made. This patient reported no further digestive troubles ten months after operation.

Recently I have operated for perforated jejunal marginal ulcer occurring after a Roux-Y operation in a subtotal gastrectomy. The latter operation was done for a marginal ulcer following a simple gastrojejunostomy for duodenal ulcer.

One of the most serious, if not the most serious menace of chronic peptic ulcer is, of course, perforation. This complication is generally said to occur in about 4 per cent of all cases, but the proportion is much greater if we consider only those cases that come to operation. For example, in the entire series of operations for gastric and duodenal ulcer at the Lankenau Hospital, of Philadelphia, during 1916 and 1917, there were 13 acute perforations—3 of gastric and 10 of duodenal ulcer, or 10 per cent of the entire number of ulcers. All of the patients recovered, operation having been performed in two to eleven hours after onset of symptoms; in one case 3 days had elapsed between the first symptoms and the operation.

About 70 per cent of the perforations occur from ulcers on the anterior wall of the stomach, those on the anterior wall toward the pylorus forming about 80 per cent of the total. About 18 per cent occur on the posterior wall, while the fundus and the cardia are very exceptionally the site of perforating ulcers. The anterior wall of the stomach being exposed to the general peritoneal cavity and also subject to a greater degree of dilatation and contraction than is the posterior wall, is also more exposed to traumatic influences. On the other hand, the posterior wall is more rigid and more protected, and ulcer developing at this site is more liable to develop perigastric adhesions as soon as any peritoneal irritation occurs; thus reinforced it is neither so apt to perforate, nor in the rare event of actual perforation, is it so likely to induce peritonitis.

The diagnosis of perforation of peptic ulcer is not a matter of great difficulty and in typical cases it is easily made by the hospital interne of average experience. The dominant symptoms are acute, overwhelming pain, vomiting, fall of temperature, rise of pulse, shock occasionally, and peritoneal reaction, i.e., early rigidity followed in from 10 to 11 hours by distention. The differentiation between a perforating gastric or duodenal ulcer is not possible, as a rule, nor is it essential, for the treatment for either or both is surgery and the earlier the intervention the better the prognosis.

Excision of an acute perforating gastric ulcer, in our opinion, is not only an unnecessary waste of time but it gives the surgeon a larger opening to close and in addition, by the possible dividing of a large vessel, it presents the risk of adding hæmorrhage to an already desperate condition. Seromuscular suture of the perforation with linen without attempting to freshen its edges is sufficient. There are, to be sure, cases in which it is not possible to close the opening securely by suture. In such instances the perforation may be closed by suturing a tag of omentum over it, or the gastrohepatic omentum may be anchored down to the perforation, or the perforated area may be packed off with gauze, as is done in other parts of the abdomen. Drainage is imperative. In perforated duodenal ulcer our procedure can be briefly summarized as consisting of closure of the perforation, plication of the duodenum to obliterate its lumen, and fortifying the area by covering with gastrocolic and gastrohepatic omentum, posterior no-loop gastro-enterostomy, and drainage of the pelvis through a suprapubic wound. This should be done in all cases whether or not the epigastric incision is drained. Although in most cases in which operation is done within 12 hours after perforation the peritoneal exudate is sterile, it is not always so, for the

colon bacillus in pure culture has been found in the pelvic exudate within less than five hours after perforation of a duodenal ulcer, although clinically there was nothing to distinguish this case from others in which the exudate is sterile. (Ashhurst, personal communication.)

We strongly disapprove of irrigating the peritoneal cavity even in late cases where particles of food can be distinguished in the exudate. Merely wiping away with moist gauze the small particles of food that are accessible gives the case a much better chance of recovery.

Primary gastrojejunostomy as a part of the operation for perforating gastric or duodenal ulcer is becoming more and more recognized as a useful procedure in properly selected cases and in the hands of the surgeon accustomed to working within the abdominal cavity.

Most surgeons agree that, where closure of the perforation produces stenosis of the pylorus, gastrojejunostomy as a primary operation is advisable. But we believe it suitable to all cases of gastric ulcer unless there is specific indication to the contrary. We have not had any cause to regret our practice, which is not the case with surgeons who have omitted the operation in certain instances. Paterson[1] for example states that among the cases of gastric perforation collected by him no less than 13 deaths in 58 cases could have been avoided had a primary gastro-enterostomy been done. Indeed, Paterson goes farther than we should be inclined to go in stating that even purulent peritonitis is no contra-indication to the operation. Caird[2] was obliged to do the operation three days after suture of a perforation on account of stenosis of the pylorus; Allingham and Thorpe[3] resorted to it one month after operation in order to hasten convalescence; and Scudder found it necessary five weeks after, and Gibbon[4] eighteen months after suture of a gastric ulcer.

For perforating gastric ulcer also we advocate primary gastro-enterostomy. Early operation is a vital factor in the prognosis of these cases. We do not consider shock, unless severe, as contra-indicating operation; yet if it is a question of immediate operation it may be one for careful consideration. Shock it appears is to a great extent due to the evacuation through the perforation of gas and intestinal contents; and the sooner the peritoneum is opened to allow the escape of the gas and the extravasated matter, and the sooner the perforation is closed, the better for the patient. If the duodenum is bound down by adhesions and the site of the perforation is not easily accessible, a large pillow placed under the lower dorsal spine, as in operations on the biliary tract, will prove of considerable assistance in bringing the duodenum nearer to the abdominal incision. The perforation should be closed with linen sutures and reinforced with a tag of omentum, when necessary. Unless the peritonitis is extensive and the patient's condition is grave, we do a primary gastro-enterostomy. We also remove the appendix, examine the gall-bladder and pancreas, and if either of the latter is diseased we deal with it as indications present.

In a few cases in which the duodenum was extremely friable and the perforation could only be imperfectly closed, resulting in temporary leakage of duodenal secretion and bile, we feel confident that the recovery of the patient was largely due to the gastrojejunal anastomosis. This is especially true in subacute perforation of the stomach and duodenum unexpectedly discovered at operation for a supposedly uncomplicated simple lesion. In such cases it is not always possible to make sutures hold in the region of the perforation. Repeated attempts to do so result only in enlarging the bowel opening, while resection is entirely out of the question. The patient's salvation lies in a gastro-jejunostomy.

[1] Paterson. See Deaver and Ashhurst, Surgery of the Upper Abdomen, vol. i, p. 127.

[2] Caird. Edinb. M. J., 1914, lxiii, 1184.

[3] Allingham and Thorpe. Lancet, Lond., 1904, ii, 886.

[4] Gibbon. Tr. Coll. Phys., Phila., 1907, xxviii, 40.

RADIUM IN THE TREATMENT OF CERTAIN TYPES OF UTERINE HÆMORRHAGE AND UTERINE FIBROIDS[1]

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INTEREST in radium as a therapeutic agent has been centered chiefly in its promising possibilities as a cure for cancer. The original claim as to its wonderful properties has been modified by extended observation, but it still offers the most hopeful outlook as a palliative and, occasionally, the curative treatment of inoperable cancer. Its absolutely original properties have hampered clinicians in their effort to estimate its just merits as a remedial agent, but extended use of it in various pathologic conditions has developed the fact that it possesses other properties equally as striking as its ability to destroy cancer-cells. The promptness with which certain types of persistent uterine bleeding respond to radium exposures, places it in the same category of specifics with quinine and the serum for diphtheria.

The term *uterine hæmorrhage*, as employed here, is limited to bleeding due to metropathies, disturbed ovarian function, chronic endometritis, metritis, and fibroids of the uterus. Bleeding associated with syphilis, chronic liver and heart, lung and kidney affections, as well as the ordinary complications of pregnancy, is naturally eliminated and mentioned to emphasize the point that uterine bleeding is only a symptom and demands careful differentiation and accurate diagnosis in its management.

Every gynecologist is impressed with the large number of cases of persistent bleeding that eventually require hysterectomy. If he is conscientious, he can only regret keenly the necessity of performing a serious mutilating operation, especially when the pathologist reports little, if any, pathologic changes in the uterus. Radium has proved to be the long-sought specific in these cases, because of the simplicity of application, the short amount of time required to effect a cure, and the uniformly satisfactory results obtained.

It has been known since 1904 that roentgen-ray exposures would control bleeding associated with fibroids of the uterus. It was subsequently shown that this effect was due to marked structural changes produced in the primordial cells of the ovary, and since the degree of ovarian stimulation governs menstruation, the depression of this function leads to a decrease of blood supply and ultimate shrinkage of the fibroid.

While the structural changes produced in the ovary by radium exposures are identical with those induced by the X-ray, the control of bleeding is probably accomplished in a different manner.

Wickham's early investigations showed that the most constant effect produced by radium was the marked change in the intima of the blood-vessels which eventually resulted in endarteritis and blocking of the vessel lumen. Wickham's results in the use of radium in the treatment of vascular nævi prompted Abbe to use it in a case of bleeding associated with a large fibroid that presented some hazardous surgical features. The bleeding was not only controlled, but the fibroid almost disappeared. Abbe's experience was soon verified by other clinicians and it was shown that radium not only has almost a specific effect in relieving the commonest complication of fibroids of the uterus, viz., hæmorrhage, but will cause a rapid reduction in the size and in many instances complete disappearance of the growth.

There is abundant evidence to prove that this effect is not produced by structural changes in the ovary. It will promptly arrest persistent hæmorrhage that occasionally occurs after double oophorectomy; in fibroids long past the menopause, an amount of radium apparently too small to radiate the area between the uterine cavity and the ovary, will often effectively correct menorrhagia.

Kelly and Burnam believe that in addition to the anæmia following the occlusion of the vessels, it exerts a specific and direct effect independent of any action upon the ovaries.

[1] Read before the American Gynecological Society, Pittsburgh, May, 1917.

The most plausible explanation is that it produces extensive structural changes in the endometrium.

During the past three years I have used radium in a series of cases that ordinarily would have been subjected to hysterectomy. Most of the cases treated during the first year were referred for radical surgical treatment and are the most valuable in a statistical study, because they were of the aggravated type and present some idea of the permanency of the results.

The histories also allow some deductions to be drawn as to the type of cases in which radium is indicated, the primary and ultimate results, as well as some contra-indications to its use.

An attempt has been made to arrange the cases in groups, according to pathologic findings, but it has been difficult to make satisfactory classifications, owing to the presence of one or several lesions in the same patient.

The classifications are similar to those proposed by Kelly and Burnam, in a recent contribution, but differ in several details.

The first group includes the cases commonly denoted as *myopathia hæmorrhagica* (hæmorrhage of the menopause) or, as Graves prefers to classify them, uterine insufficiency. These cases present, as a rule, little, if any, defined anatomic cause to account for the bleeding and comprise some of the most serious instances of acute hæmorrhage. It occurs most commonly in women approaching the menopause, though it may be found in comparatively young women. The uterus may be normal in size, or slightly enlarged and often presents a normal endometrium. The bleeding is supposed to be due to a disproportion of connective tissue over muscular tissue in the myometrium, or to some aberration of ovarian secretion, or other ductless glands.

There were 8 cases in this group and a glance at the résumé of cases will convince the experienced surgeon that had not radium been available most of them would have been subjected to hysterectomy. All but 1 had been curetted; several had been curetted twice, and one as many as five times; 2 had been treated by prolonged X-ray exposures. Six cases received only one application of radium. Two cases required two applications. All but two menstruated once after the application. One-half of the number reported menopausal symptoms. One case, living at a distance, reported only temporary relief and had a second application made elsewhere. A late report from this case states that she was cured. The dosage had been made small in this case with the hope that the flow would be reduced and the menstrual function preserved.

The bleeding was controlled primarily in 100 per cent, with 90 per cent of permanent results. The average time from the treatment until amenorrhœa occurred was four weeks.

The second group included patients presenting a history of menorrhagia or metrorrhagia, lasting for months, or years, practically all of whom had a uniformly enlarged, hard, or occasionally flabby, uterus. Many gave a history of puerperal complications. In some, the origin of the trouble appeared to be extensive lacerations of the cervix involving the parametrium. These cases are ordinarily classified as chronic metritis, polypoid endometritis, hyperplasia, fibrosis, etc. I desire to emphasize the point that none of this group was of the type usually relieved by curettage, plastic operations, etc., for a glance at the histories will show that practically every one had been subjected to some such treatment and more than half were referred for some radical surgical measure.

A point also to be emphasized is that so far as could be determined, none of this group showed a latent tubal infection.

The intra-uterine manipulations necessary in the application of radium make it essential to minimize the risk of stirring up a dormant tubal disease by a careful selection of the cases. Two rather unpleasant experiences fully illustrate this point. One promptly developed a pus tube that required vaginal incision and drainage; the other passed through an attack of salpingitis that fortunately subsided without serious damage.

There were 18 cases in this group, varying in age from 21 to 55 years, with an average of 40.7 years. Amenorrhœa was produced in every case within one month after treatment. Only one case reported a return of the menses.

She menstruated for eight days one year after the application. The flow was not profuse and she was advised to delay further treatment until it was determined whether it would be necessary.

Thirteen cases received one application; 5 received two. Cases living at a distance were given two applications, in order to avoid a possible second trip in case of failure.

This series gives some idea of the duration of the results. All but two have been recently communicated with and none reports a return of the bleeding. Many presented an enlarged uterus before treatment. Every one examined three months or longer after the treatment showed a uterus approximately normal in size. The menopausal symptoms seemed to be more pronounced in this group than in any of the other series. Five cases reported the flushes to be very severe and 2 insisted that they would prefer the bleeding to the flushes and nervousness. Five patients who complained of the menopausal symptoms were benefited by corpus luteum extract which seemed to be more effective when given hypodermically. This series gives a very fair estimate of the therapeutic value of radium. All were anæmic, nearly all had submitted to some form of surgical treatment without relief, and all but 2 have regained their normal health.

The group of myomata comprises 26 cases. The average age was 40.5; the youngest was 29; the oldest 48 years. Menorrhagia, or metrorrhagia, was present in all the cases. So far as could be determined by examination, the appendages were involved in only 2 cases. Cystic disease of the ovaries and hydrosalpinx are frequent complications of fibroids, but if the history of the case and physical examination revealed such complications, operation was advised in preference to radium.

The 2 cases that failed to respond to treatment gave evidence of a chronic salpingitis.

Two cases of the series illustrate conclusively that radium is more effective than the X-ray. Both had been given 20 exposures by an experienced radiologist, who employed the Gauss technique, with only temporary results. Only one intra-uterine application of radium sufficed to stop the bleeding permanently.

In one instance, bleeding was checked by two exposures, in which the fibroid was as large as a seven months' pregnancy. She had marked anæmia and cardiac changes that would have made the outcome of a surgical operation extremely doubtful. She improved rapidly and three months after treatment, the growth was successfully removed.

In 22 cases the bleeding ceased within 5 weeks and has never returned. In 5 it was controlled for a few months, but was never so severe after its reappearance. In 2 of these the menses became regular after 8 months. In only 2 cases has the radium failed, and these would very probably have been relieved by anôther radiation.

Control of bleeding is not the only desideratum in treating fibroid tumors. The growth of the tumor must be stopped, and, if possible, the tumor be made to disappear. It was not possible to ascertain the change in size of the fibroid in 11 cases.

In 16 cases examined from three months to two and one-half years after treatment, there had been a reduction in the size of the tumor, varying from complete disappearance in three cases to about one-half of the original size in practically 50 per cent of the number.

Some further points in regard to the fibroid group are worthy of comment. It will be noted that most of the growths selected for radium treatment were small, the only large tumors being those presenting contra-indications to operation.

This feature is emphasized because I do not wish to imply that radium is to supplant surgery in the treatment of fibroids. I wish to show that it is a most valuable adjunct to surgery. The average uncomplicated fibroid can be removed by a competent surgeon with very little risk to the patient, but there is a fairly large percentage of cases that are hazardous surgical risks, among which might be mentioned the cases presenting cardiac and renal lesions and marked anæmia. Since I have made it a rule to study the blood pressure in all cases of fibroids, I have been amazed to learn how many present an extremely high vascular tension even when

they show a severe type of anæmia. In such cases, rest, diet, and radium may relieve the situation altogether, or convert the case into a safe surgical risk.

If the only annoyance a woman experiences who suffers from a fibroid is bleeding, is there sufficient justification for performing hysterectomy? My experience with radium prompts me to answer in the negative. If the growth is sufficiently large to produce pressure symptoms, operation is preferable because of the time consumed in reducing it by radium. If evidence of infection, or degeneration exists, or the appendages are diseased, operation is the best procedure. If the woman is young, she should be advised to submit to operation with the idea of performing myomectomy and preserving the uterus.

For small or medium-sized growths, and those presenting contra-indications to operation, radium is the ideal remedial agent.

Submucous growths should be treated surgically, unless contra-indications to operation are present, owing to the tendency of this type to become infected or develop other degenerative changes.

In a fourth group, I desire to record 2 cases of serious uterine bleeding in young girls, who had been treated by rest, tonics, astringents, ovarian extract and curettage. The uterine scrapings showed hyperplastic glandular endometritis. Their ages were 15 and 16 years. The pelvic organs were apparently normal. The hæmorrhage had been so severe in 1 case that transfusion had been considered. Short exposures, with 25 milligrams of radium element were made, with the hope that the flow could be reduced without producing amenorrhœa. Each received three-hour applications twice, the treatments being given 2 weeks apart.

The result has been all that could be desired, even though the risk of permanent amenorrhœa was greater than should be taken in the ordinary case of this type. Both now menstruate regularly, after a period of amenorrhœa which lasted 3 months.

While the results obtained by various authorities are practically the same, the dosage employed has been by no means standardized. It has been practically established that a 1,000 milligram-hour exposure, or, in other words, 50 milligrams of the radium element, introduced into the uterine cavity for 20 hours, is almost certain to produce permanent cessation of the menses. Some employ larger doses and longer and repeated exposures, but many of the cases herewith reported show that the desired results may be obtained with smaller dosage.

In fibroids, the size of the growth and the degree of hæmorrhage should govern the amount used and the duration of the exposures.

If conclusions may be drawn from a limited number of cases, it has been proved that radium possesses almost a specific effect in the control of certain types of persistent uterine hæmorrhage. It possesses every advantage over X-ray treatment, in that it acts promptly, is free from the risk of cutaneous burns, is easily applied, and acts by producing changes in the endometrium or uterus, rather than in the ovaries. It will reduce the size of probably 80 per cent, cause the disappearance of many fibroid tumors, and if carefully used, excessive menstruation may be reduced without causing amenorrhœa.

Those who have had experience with radium must agree with Kelly and Burnam who state that, "In its brilliancy of curative results it is fully equal to radical surgical procedures while offering the advantages of freedom of pain and the various postoperative complications and sequellæ. Furthermore, when radium fails we still have the operation to fall back on and have lost nothing in the waiting."

Since such results may be obtained by a method of treatment that entails only one or two days' confinement to bed and which causes only temporary discomfort amounting to little more than nausea or uterine colic, we must accept radium as a most valuable and necessary adjunct to gynecological surgery.

GROUP I. — CASES OF MYOPATHICA HÆMORRHAGICA

CASE 19. May, 1915. Age, 42. Severe hæmorrhage for ten days each month; extreme nervousness; dysmenorrhœa; several years' duration. Uterus slightly enlarged. Previous treatment: medicinal; twenty-three X-ray exposures. On May, 1915,

52 milligrams for twelve hours; November, 1916, 52 milligrams for twelve hours. Menstruated three times after first radium application; menses reappeared, November, 1916; second application followed by amenorrhœa; marked menopausal symptoms.

CASE 12. October, 1914. Age, 46. Severe menorrhagia; dysmenorrhœa. Uterus slightly enlarged. Previous treatment: medicinal; curetted twice; cervix amputated two years previously. Radium treatment of 52 milligrams for 16 hours. Prompt cessation of menses; menopausal symptoms very slight; no return up to March, 1917.

CASE 14. December, 1914. Age, 45. Menorrhagia for six years; dysmenorrhœa. Uterus slightly enlarged. Previous treatment: medicinal; curettage. Radium treatment of 52 milligrams for sixteen hours. Amenorrhœa; one period after application; no return to March, 1917.

CASE 102. May, 1916. Age, 39. Menorrhagia for five years; severe dysmenorrhœa; metrorrhagia for last three months. Uterus slightly enlarged. Previous treatment: curetted four times with only temporary relief. Radium treatment of 52 milligrams for fourteen hours. Not relieved by treatment; wrote in November, 1916; she would have radium treatment repeated in Chicago.

CASE 23. August, 1915. Age, 25. Menorrhagia from beginning of menstrual period; metrorrhagia for four to six months at a time; anæmic. Uterus of normal size. Previous treatment: curetted six times in five years; small cyst removed from right ovary five years before radium treatment; twenty-eight X-ray applications without relief. Radium treatment of 77 milligrams for seventeen hours. Amenorrhœa; one period soon after application; vaginal discharge for about two months; one short period eight months later; still well March, 1917; no menopausal disturbances; gained weight; not nervous.

CASE 22. July, 1915. Age, 35. Metrorrhagia lasting three months; four times during two years. Uterus slightly enlarged. Previous treatment: curetted, May, 1914; small polypus removed from cervix; bleeding continued. July, 1915, 25 milligrams for ten hours; October, 1915, 52 milligrams for nine hours. Bleeding stopped for two months, but second application necessary, after which amenorrhœa was complete; slight menopausal symptoms; in splendid health February, 1917.

CASE 30. October, 1915. Age, 35. Dysmenorrhœa; metrorrhagia. Uterus undersize. Previous treatment: has been curetted twice without results. October, 1915, 52 milligrams for two and a quarter hours. For six menstrual periods the flow was reduced to three days; no recent report; short period of exposure in order to preserve menstrual flow.

CASE 148. September, 1916. Age, 45. Menorrhagia for five years; severe anæmia. Uterus about normal size. Previous treatment: curetted without relief one year previous. September, 1916, 77 milligrams. December, 1916, amenorrhœa after first period; slight menopausal symptoms; color good; gained weight.

GROUP II.—BLEEDING FROM HYPERPLASTIC ENDOMETRITIS AND CHRONIC METRITIS

CASE 16. March, 1915. Age, 38. Severe menorrhagia for four years; nervousness; anæmic. Appendages normal; uterus about twice normal size and sensitive to pressure. Previous treatment; often required packing to control bleeding; curetted twice without relief; scrapings showed hyperplastic endometritis. Radium treatment of 52 milligrams for sixteen hours. Bleeding ceased ten days after application; amenorrhœa since; had leucorrhœa for about six weeks after treatment; some bladder irritation occasionally, but had similar trouble before treatment; general health much improved; uterus of normal size.

CASE 28. August, 1915. Age, 37. Menorrhagia; several times metrorrhagia; very nervous; anæmic; leucorrhœa; history of puerperal infection. Uterus about twice normal size; sensitive to pressure; appendages apparently normal. Previous treatment: curetted twice with temporary relief; cervix amputated for bad laceration and cystic disease. Radium treatment of 52 milligrams for twenty hours. Amenorrhœa; in March, 1916, stated that occasionally a bloody stain appeared; profuse leucorrhœa; October, 1916, bleeding had returned.

CASE 24. October, 1915. Age, 35. Menorrhagia for ten years; metrorrhagia for five months before treatment; extreme anæmia; hæmoglobin only 20 per cent. Uterus about three times normal size; scrapings showed polypoid endometritis. Previous treatment: packing, medicinal. Radium treatment of 77 milligrams for fourteen hours. Prompt amenorrhœa; gained weight rapidly; recent report states that she is well; no menopausal symptoms.

CASE 18. April, 1915. Age, 37. Menorrhagia; dysmenorrhœa; anæmia. Body of uterus slightly enlarged. Previous treatment: curettage; amputation of lacerated cervix; scrapings showed hyperplastic endometritis. April, 1915, 52 milligrams for fourteen hours; May 10, 1915, 52 milligrams for fourteen hours. First period following application very painful and the flow profuse; afterward amenorrhœa; flushes and nervousness marked for a time; leucorrhœa for two months; general health much improved.

CASE 21. June, 1915. Age 21. Metrorrhagia for several months. Uterus slightly enlarged. Previous treatment: curettage; both tubes, left ovary and portion of right ovary removed. June, 1915, 52 milligrams for twenty-four hours. Prompt amenorrhœa after one period. No further return of trouble.

CASE 74. February, 1916. Age, 44. Severe metrorrhagia for four years, lasting ten days. Uterus about twice normal size. Previous treat-

ment: curettage; amputation of badly lacerated cervix; bleeding not influenced; polypoid endometritis. February, 1916, 77 milligrams, for twelve hours. Amenorrhœa after first period. Flushes for four months; no return of trouble after March, 1917.

CASE 85. February, 1916. Age, 49. Menorrhagia for ten years; metrorrhagia for two years; anæmia. Uterus about twice normal size. Pervious treatment: curetted about four times without relief; scrapings showed hyperplastic endometritis. February 5, 77 milligrams for twenty-four hours; February 30, dose repeated. Prompt amenorrhœa; no menopausal disturbances; last report states that she is perfectly well.

CASE 87. March, 1916. Age, 37. Severe hæmorrhages; menorrhagia for two years. Chronic metritis; uterus enlarged; sensitive; tubes apparently normal. Previous treatment: curetted twice without more than temporary results. March, 1916, 77 milligrams for twenty-six hours. Amenorrhœa until March, 1917, then profuse flow for eight days; menstruated at regular times in April, 1917; flow was profuse; uterus normal in size.

CASE 117. May, 1916. Age, 43. Menorrhagia; severe dysmenorrhœa. Uterus enlarged, tender, hard. Previous treatment: curetted. May, 1916, 77 milligrams for ten hours; June, 1916, 52 milligrams for fourteen hours. Menstruated once, then periods ceased; leucorrhœa for two months; flushes; nervousness for four months. No return up to March, 1917.

CASE 117. May, 1916. Age, 45. Metrorrhagia frequently for three years; anæmia. Uterus uniformly enlarged; about twice normal size. Previous treatment: medicinal, rest, packing; excessive endometrium. May, 1916, 77 milligrams for ten hours; June, 1916, 52 milligrams for fourteen hours. Amenorrhœa after first period; flushes; leucorrhœa; uterus normal size in three months.

CASE 114. May, 1916. Age, 42. Severe menorrhagia for four years. Body of uterus hard and twice normal size. Previous treatment: curetted; cervix amputated one year before treatment, because of extensive laceration and cystic disease, without controlling bleeding. May, 1916, 77 milligrams for sixteen hours. Amenorrhœa followed first period; usual menopausal symptoms; gained weight; in good health February, 1917.

CASE 156. January, 1916. Age, 47. Severe menorrhagia. Uterus uniformly enlarged; hard; about three times normal size. Previous treatment: medicinal. January, 1916, 52 milligrams for twelve hours; February, 1916, 77 milligrams. Amenorrhœa after six weeks; nervousness; flushes; headaches; leucorrhœa; October, 1916, uterus normal in size.

CASE 122. August, 1916. Age, 55. Severe menorrhagia; weight 240 pounds; asthma. Chronic metritis; uterus hard, enlarged. Previous treatment: medicinal only, owing to weight and severe asthma. August, 1916, 52 milligrams for fourteen hours. Amenorrhœa; no serious menopausal symptoms; October, 1916, uterus normal in size.

CASE 127. July, 1916. Age, 43. Metrorrhagia for three months; history of puerperal infection. Uterus about twice normal size. Previous treatment: curetted, without results; hyperplastic endometritis. July, 1916, 52 milligrams for fifteen hours. Amenorrhœa; menopausal symptoms marked at first; leucorrhœa for three months; no return of flow up to March, 1917.

CASE 128. July, 1916. Age, 35. Menorrhagia; dysmenorrhœa. Uterus about twice normal size. Previous treatment: curetted, cervix repaired without relief; X-ray applications for several weeks, without result. July, 1916, 52 milligrams for thirteen hours. Amenorrhœa; leucorrhœa for three months; rather trying menopausal symptoms, which were relieved by corpus luteum extract.

CASE 129. July, 1916. Age, 51. Menorrhagia for several years; had goiter removed ten years before treatment; cardiac insufficiency. Uterus enlarged and hard, sensitive to pressure. Previous treatment: medicinal; polypoid endometritis. July, 1916, 52 milligrams for ten hours. Amenorrhœa; menopausal symptoms, which were relieved by corpus luteum extract; uterus normal size March, 1917.

CASE 137. August, 1916. Age, 30. Menorrhagia; severe dysmenorrhœa; extreme nervousness; profuse leucorrhœa; puerperal infection. Uterus uniformly enlarged, sensitive; endometritis. Previous treatment: right ovary had been removed for cystic changes; curetted; chronic endometritis August, 1916, 52 milligrams for fourteen hours. Amenorrhœa; profuse leucorrhœa for three months; menopausal symptoms; six months later had gained weight and uterus was of normal size.

CASE 138. August, 1916. Age, 45. Nervousness; menorrhagia; anæmia. Uterus enlarged and hard. Previous treatment: curettage; partial amputation of badly lacerated cervix; no relief. August, 1916, 52 milligrams for twelve hours. Amenorrhœa after two periods; leucorrhœa for some time; menopausal symptoms rather severe; improved by corpus luteum extract.

GROUP III.— BLEEDING DUE TO MYOMATA

CASE 69. November, 1915. Age, 40. Severe menorrhagia for ten days each month. Three small growths about 3 centimeters in diameter. Previous treatment: curettage. 1248 milligram hours, with 52 milligram tube. Amenorrhœa after one month; menses have never returned; condition of growth not known.

CASE 70. December, 1915. Age, 43. Dysmenorrhœa; menorrhagia. Several small fibroids. Previous treatment: curettage when radium was applied. 2000 milligram hours, with 52 milligram tube. Amenorrhœa; no return of flow one year later; size of growths not known.

CASE 73. December, 1915. Age, 43. Menorrhagia for five years; dysmenorrhœa. Multiple fibroids; uterus about size of three months preg-

nant uterus. Previous treatment: curetted to eliminate carcinoma when radium was applied. 1800 milligram hours, with 50 milligram tube. Amenorrhœa; April, 1916, four months after treatment, uterus very little larger than normal size.

CASE 76. January, 1916. Age, 38. Metrorrhagia; severe hæmorrhages. Multiple fibroid size of six months pregnant uterus; history of probable infection. Previous treatment: patient very stout; mitral disease; refused operation. 1878 milligram hours, January, 14 1916, and 1878 milligram hours, February 3, 1916. Patient wrote four months later that she had not improved very much; no examination of growth had been made.

CASE 78. January, 1916. Age, 38. Metrorrhagia; very stout; myocardial changes marked; hæmoglobin, 20; large tumor. Growth size of seven months pregnant uterus. Previous treatment: rest in bed; packing of vagina. January, 1916, 77 milligrams for twenty-four hours (1878 milligram hours); same dosage repeated in February, 1916. Hæmorrhage ceased promptly; patient improved sufficiently to have hysterectomy successfully performed three months later.

CASE 81. February, 1916. Age, 45. Metrorrhagia; occasional severe hæmorrhage; stout. About 5 centimeters in diameter, size of growth. Previous treatment: rest in bed; often packed. February, 1916, 77 milligrams for twenty-four hours (1878 milligram hours). Prompt cessation after one month; no return up to February, 1917; December, 1916, growth hardly perceptible.

CASE 103. May, 1916. Age, 36. Menorrhagia; dysmenorrhœa. Growth 5 centimeters in diameter. Previous treatment: myomectomy; curettage. May, 1916, 693 milligram hours; 77 milligram tube; April, 1917, 1232 milligram hours. Amenorrhœa until January, 1917, then had steady bloody stain, until second treatment; reduced more than one-half.

CASE 106. May, 1916. Age, 48. Severe uterine hæmorrhages at intervals for twelve years; menorrhagia; high blood pressure; irregular heart. Size of growth about 6 centimeters in diameter. Previous treatment: curettage; packed several times. May, 1916, 600 milligram hours; June, 1916, 700 milligram hours. Prompt cessation of flow; growth about the size of an olive six months later; no return of trouble up to April, 1917.

CASE 4. November, 1914. Age, 40. Extreme nervousness before menses; menorrhagia. Small multiple fibroids. Previous treatment: curetted twice. 1666 hours, with 52 milligram tube. Amenorrhœa; no return to date, except one menstrual flow about fifteen months later.

CASE 11. September, 1914. Age, 40. Nervousness; menorrhagia for five years; dysmenorrhœa. Small interstitial fibroid. Previous treatment: myomectomy, 1913; also small polypus removed; flow not influenced. September, 1914, 108 hours; November, 1914, 416 hours. Amenorrhœa; no return to date; very much annoyed by flushes.

CASE 17. April, 1915. Age, 40. Metrorrhagia; very severe hæmorrhages. Interstitial fibroid about 5 centimeters in diameter. Previous treatment: curetted four times. April, 1915, 936 milligram hours; May, 1915, 1386 milligram hours. Bleeding promptly stopped; no further menstruation; clear discharge for a time; June, 1916, growth hardly perceptible.

CASE 20. July, 1915. Age, 45. Menorrhagia for eighteen years; occasionally metrorrhagia; extreme nervousness at periods. Size of growth 5 centimeters. Previous treatment: X-ray treatment, 20 applications. July, 1915, 1125 milligram hours. Prompt cessation of menses; no return to date; growth one-half original size.

CASE 25. August, 1915. Age, 39. Menorrhagia for eight years; worse past four years; 10-day duration. Size of growth, 5 centimeters. Previous treatment: curetted. August, 1915, 580 milligram hours. April, 1916, menstruated five days; now appears for four days, but slight; tumor decreased two-thirds original size.

CASE 26. July, 1915. Age, 43. Menorrhagia; occasional severe hæmorrhage. Two fibroids (interstitial), largest about 4 centimeters. Previous treatment: curetted. July, 1915, 520 milligram hours. Menstruated once after application; no return up to April, 1917; uterus almost normal size, fibroid hardly palpable.

CASE 50. October, 1915. Age, 35. Metrorrhagia; severe dysmenorrhœa. Fibroid about 5 centimeters in size. Previous treatment: rest; styptics; packing. October, 1915, 580 milligram hours. Three months later growth one-half original size; menstruated two days each month; March, 1916, menses ceased.

CASE 68. December, 1915. Age, 43. Metrorrhagia for one year; dysmenorrhœa. Fibroid about 4 centimeters in size. Previous treatment: rest; local treatment. 1248 milligram hours, with 52 milligram tube. Amenorrhœa after three weeks; no return up to April, 1917; tumor hardly perceptible.

CASE 115. June, 1916. Age, 42. Menorrhagia for ten years; often severe hæmorrhages; positively declined operation. Size of growth about 8 centimeters; also right chronic salpingitis. Previous treatment: curettage; 40 X-ray exposures, which controlled bleeding for only a short time. June, 1916, 700 milligram hours, with 50 milligram tube. Two weeks later pelvic abscess was drained in vault of vagina; amenorrhœa for eight months.

CASE 118. June, 1916. Age, 43. Severe menorrhagia for ten years. Growth about 6 centimeters. June, 1916, 924 milligram hours. Prompt cessation of menses; no return April, 1917; severe menopausal symptoms.

CASE 143.—Age, 40. Severe menorrhagia. Growth about 6 centimeters. August, 1916, 800 milligram hours. Amenorrhœa; reduced 50 per cent in four months.

CASE 149. September, 1916. Age, 48. Severe hæmorrhages; menorrhagia for many years; myocardial disease; high blood pressure; very stout;

marked anæmia. Growth about 10 centimeters. Previous treatment: rest; curettage. September, 1916, 1232 milligram hours; November, 1916, 1309 milligram hours. Amenorrhœa six months later; uterus slightly larger than normal size.

CASE 150. August, 1916. Age, 36. Menorrhagia for four years; metrorrhagia for three months. Growth about size of three months' pregnancy. Previous treatment: medicinal; rest. August, 1916, 750 milligram hours; November, 1916, 600 milligram hours. Amenorrhœa; her physician reports that she has been relieved; did not examine growth.

CASE 158. November, 1916. Age, 46. Severe menorrhagia and dysmenorrhœa for three years; intermittent heart; extremely stout. Growth about 20 centimeters. November 5, 1916, 1694 milligram hours; November 11, 1916, 924 milligram hours. Four months later uterus normal size; no tumor palpable; did not examine growth.

CASE 166. December, 1916. Age, 36. Severe menorrhagia for eighteen months. Growth about size of three months' pregnant uterus. Previous treatment: medicinal; local treatment; curettage. December, 1916, 1848 milligram hours; December 10, 1916, 700 milligram hours. March, 1917, uterus reduced over one-third in size; small fibroid on posterior wall about same size; amenorrhœa.

CASE 15. March, 1915. Age, 36. Severe dysmenorrhœa; menorrhagia; pronounced anæmia; bleeding has been pronounced for four years; extreme nervousness. Size of growth about 3 centimeters. Previous treatment: medicinal; curetted about two years before treatment; no result. May, 1915, 25 milligrams for twenty-four hours. Amenorrhœa for six months, since then periods last from three to five days; no clots; gained weight; nervousness practically disappeared (April, 1917); no examination to determine size of tumor.

CASE 120. June, 1916. Age, 29. Menorrhagia; dysmenorrhœa. Small interstitial fibroid. Previous treatment: medicinal; curettage. Radium treatment of 52 milligrams for fifteen hours. Amenorrhœa; menopausal symptoms marked.

CASE 152. September, 1916. Age, 41. Menorrhagia for four years; metrorrhagia for four months; extreme anæmia (hæmoglobin 20 per cent). Uniformly enlarged uterus about size of three months' pregnant uterus. Previous treatment: medicinal; curettage; polypoid endometritis. Radium treatment of 77 milligrams for fifteen hours. Was extremely weak for five months afterward, owing to severe anæmia; amenorrhœa prompt; menopausal symptoms mild; April, 1917, feels well; blood picture about normal; no return of menses; growth reduced one-half in size.

A CYSTOSCOPIC STUDY OF THE END-RESULTS OF VARIOUS FORMS OF CYSTOCELE OPERATIONS[1]

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DURING the past year and a half a series of studies has been carried on by myself and Doctor Rawls as to the condition of the interior of the urinary bladder in patients who have had some form of cystocele operation.

For the purpose of this study end-results only were sought. In securing the end-results it was considered necessary that at least one year should have elapsed since operation and examination. With this limitation of time following such operations, 150 ward patients constituting the hard working class were asked to return to the hospital for examination. With the approval of the surgeons these patients were taken from the service of every operator in the hospital, and can well be said to represent a fair average of the results obtained by operators who are trained in this character of work. There was no selection of cases, all cystoceles and procidentias were taken.

We received responses from some 50 patients, or one-third of those to whom a summons was sent. The majority of these patients responded to our request apparently from a desire to have us pass judgment on their condition, and others on account of not being entirely relieved of the symptoms for which they had been operated on.

Only one patient complained of increased urinary symptoms following her operation. This patient had had an interposition operation. Prior to her operation she had no urinary symptoms. When seen thirteen months later she complained of frequent and painful

[1]Read before the American Gynecological Society, Pittsburgh, June 1, 1917.

micturition. The cystoscopic examination gave marked trigonitis with many folds of the trigone. The mouths of the ureters could be seen only by holding the cystoscope almost in a vertical position. In spite of this bad cystoscopic finding the vaginal examination gave an excellent result.

With this exception, none of the patients examined stated that any urinary symptoms they might have had were aggravated; to the contrary the very large majority stated that they had been in part or entirely relieved of such symptoms. This was very striking, since only 9 of the 49 patients examined showed a normal bladder base.

At the commencement of this study it was our intention to photograph the base of the bladder and procure if possible a composite picture of the end-results following different methods of operating. During the spring of 1916, I procured for this purpose an excellent wide angle Loewenstein photographic cystoscope. The plates as made by Eastman were much more rapid than those of the German make sent with the instrument. The pictures procured by Dr. Rawls were excellent and we felt that with practice a two-piece picture could be made to include the entire base of the bladder. The study was discontinued during the summer. When resumed in the fall, it was found that all the plates on hand had become fogged, and we have been unable in spite of persistent effort to have more made, on account of the extra thin glass required, and the inability of the Eastman Company to obtain this from abroad.

This paper for the reason given is of necessity, therefore, a preliminary report. The study will be continued with the aid of the photographic pictures, as soon as the needed plates can be obtained.

The operations upon the patients examined included in addition to those for cystocele and posterior wall repairs: hysterectomies, interposition and trisection operations for procidentias, also abdominal operations on the uterus and adnexa.

For the purpose of this preliminary report twelve (12) patients were found to have a practically normal plane of the base of the bladder. Three of these had a mild trigonitis. The character of cystocele operations done upon these patients varied greatly. In the larger number the operative procedure consisted in freeing the bladder from the vaginal mucosa and uterus, coapting the prevesical fascia under the bladder and approximating the vaginal mucosa after the excess had been removed. In a few the operations consisted simply in the separation of the vaginal mucosa on each side of the median incision, the removal of the excess, and an approximation of the edges under the bladder. In one the operation was after the old Emmet method, and in one the bladder was anchored on a higher plane to the broad ligaments and uterus, after it had been separated from the vaginal mucosa and uterus.

In another series of cases, the base of the bladder was found to be thrown into horizontal folds of varying degrees of prominence. There were 8 patients in this group.

In 4 of these there was no displacement of the ureter mouths; in the other 4, this displacement was very noticeable. The character of operations done in these cases was as follows: In 3 after the separation of the bladder from the vaginal mucosa and the uterus, the prevesical fascia was united under the bladder, the excess of the mucosa was removed and edges coapted. In 3 others, after the separation of the bladder from the mucosa and the uterus, the base of the bladder was anchored by silk sutures higher up on the broad ligament and uterus, or to the shelf made by the united broad ligaments if the uterus was removed. In one case an oval denudation was made on the anterior wall and the edges coapted.

The cystoscopic examination of these 8 patients showed, as stated, the base of the bladder in each instance to be thrown into horizontal folds of varying depth and extent. In some the mouths of the ureters were found displaced, in others in addition to the displacement, one or both could not be located. Trigonitis of a mild degree of the granular or membranous type was the usual accompaniment.

The uniform method of putting 300 cubic centimeters of water in the bladder was followed in the entire cystoscopic study.

When abnormalities were found as in these and other cases, the bladder was distended to its full capacity to determine whether or not the folds would disappear. In no instance was this accomplished. The convolutions and sulci remained as first seen under the 300 cubic centimeters distention, showing that they were of a permanent character.

The kind of operation done did not seem to bear in a marked degree upon the character and extent of the permanent folds found to be present. As for instance in Case 14641, the bladder had been separated from the uterus and the vaginal mucosa, and the prevesical fascia united underneath. The vaginal examination did not show a perfect end-result. The cystoscopic examination showed the bladder mucous membrane thrown into many convolutions. The capillaries of the bladder were dilated throughout, the ureter mouths could be seen only by holding the cystoscope in almost a perpendicular position. In Cases 15559 and 14382, the cystocele operations were of the same character as that in the previous patient. The folds of the base of the bladder were present in both, yet in a much less degree. The ureter mouths in these instances were easily seen.

Again in Cases 13653, 13541 and 13950, the bases of the bladders were attached on higher planes by linen sutures to the shelves formed by the broad ligaments when a hysterectomy was done; or to the broad ligaments and uterus if the uterus was retained. In one of the these, Case 13541, the vaginal examination gave an excellent result, yet the interior of the bladder was in a badly folded state. Case 13653 did not show so good an anatomical result, yet the base of the bladder was not thrown in as many folds. In Case 13950, the final anatomical result was not altogether satisfactory, the cystocele and rectocele had in part returned; here the folds in the base of the bladder were at a minimum.

In Case 16371, the patient on whom an oval denudation of the anterior wall was done, followed by coaptation of the edges, showed a deep sulcus to the left of the trigone, with a granular trigonitis.

As an end-result in all of the 8 patients under consideration in this group, we found that in 6 there were no urinary symptoms; with the remaining 2, the urinary symptoms prior to the operations were improved.

In a third group of patients, the folds of the base of the bladders were found to be from side to side (transverse), opposite to the direction of the folds of the bladder bases of those just reviewed. There were also 8 included here.

The convolutions varied in degree and as with the previous group they could not be obliterated by the full distention of the bladder. The character and degree of the convolutions as in the previous cases did not bear any definite relation to the kind of operations done. In 5 of these, while the folds varied in character, the condition of the base of the bladder was equally bad in all of them. In 3 cases, 15160, 16462, and 15618, the bladder had been anchored to the broad ligament and uterus on a higher plane. In the other 2 cases, 14017 and 15078, the prevesical fascia was united under the bladder after the separation from the vaginal mucosa and the uterus. In the remaining 3, the convolutions were at a minimum, yet the operation was of the same character as that done on the two patients before, that of suturing the prevesical fascia under the separated bladder.

As in the previous group, no vesical irritation that was present could be charged up to the operation. In two, the patients were cured of their vesical symptoms. In another two, the symptoms were improved. In two others, there was no improvement, yet the patients stated that they were no worse than before the operations. In one, the patient had no symptoms, before or after.

The final group of cases brought together are those on whom the uterus was interposed between the bladder and the vaginal layers. Also cases where the uterus was reduced in size by removing a large wedge before interposition.

This class includes 10 patients. As would be expected, the bladder base was thrown into a large horizontal fold with deep sulci on one or both sides and also frequently above the fold. The ureter mouths were displaced in every instance and in almost every case one

or both were located with difficulty. In 4 cases, one of the uterers could not be found.

Trigonitis, with the frequent presence of dilated capillaries throughout the entire bladder mucosa was the rule. In one instance, Case 16195, this congestion of the base was marked. Micturition was more frequent than before the operation. Here, as previously stated, the ureter mouths could only be found by holding the cystoscope almost perpendicular to the floor. The vesical symptoms of the patients of this group were as with the previous groups, remarkably negative. Seven patients were free from any vesical irritation or frequent urination; with one the loss of control before the operation was not relieved. In one there were, as stated, no symptoms before the operation. Since the operation, however, she had frequent micturition. This patient had a marked trigonitis.

This detailed review of the study of the end-results on these patients, from the viewpoint of the anatomical condition in which the base of the bladder is left, is not of a flattering character. That the abnormal conditions found were of a permanent character cannot be questioned, since they did not disappear under full distention.

Operators have not, as far as I know, given the condition of the interior of the bladder any consideration in cystocele operations; our whole thought has been centered on restoring the anterior vaginal wall to an apparently normal state by such a character of operation as would insure a permanent result. The bladder interior is a remarkably tolerant organ and seems to require bacterial infection before symptoms result. This fact has been long recognized and is accentuated by this study. In the entire number of patients examined only two were found to have vesical symptoms as a sequel to the operation. To the contrary with many the frequency of urination complained of before operation was either improved or cured as a result of the operation.

However, the fact remains that with our prevailing methods of repairing cystocele and operating for procidentia, the base of the bladder as seen through the cystoscope is in the majority of instances thrown into folds and sulci.

The query naturally presents itself that although apparently there is no disturbance as a result of this departure from the normal plane-like floor, does not such a state render more possible some future disturbance of a systemic character?

The downward peristalsis of the ureters with the valve-like action of the mouths are recognized. In the presence, however, of displacements and fixation of a part of the vesical portion of these ducts, buried as in many instances among the artificial folds, it is not inconceivable that the final result may be far-reaching in disturbing the general health of the patient. This can only be a belief, yet I think a legitimate one. The truth of such a possibility cannot, from the nature of the condition, be determined except by painstaking investigation of each individual patient over a long period of years. This is hardly possible from the nomadic character of the average hospital patient. The departure, however, from the normal plane of the trigone with its interference with the complete emptying of the bladder, as is the case in some instances, must predispose to bacterial infection with its resulting symptoms and sequelæ.

As seen from a study of these patients, the kind of operations done did not appear to have any connection with the extent of the distortion of the base of the bladder. In anchoring the bladder base to a higher plane with sutures attaching it to the broad ligament, proportionately as many abnormalities were produced as by the other method of having the bladder free after its separation from the uterus and bringing together the tissues underneath it. In these patients when the bladder base was found free of convolutions, operations of the same general character were done as in those having convolutions.

The degree of the cystocele found at the first examination, has never been noted in the history of the patient, the single word "cystocele" covering an extensive prolapse of the anterior wall, as also one of a very mild character.

It is in this difference of degree of the anterior prolapse, that I believe exists in a measure the key as to whether the base of the bladder is left in a normal or convoluted state. At least following the examinations done on the patients we have studied, unquestionably patients with only a moderate prolapse, upon whom a small area of separation of the mucosa is done, are less liable to extensive folding of the base than those of an extensive prolapse, with a proportionately larger separation.

This brings up the contraction and involution of the overdistended bladder tissues. It has been heretofore supposed, though little attention has been paid to it, that these tissues when given their proper support, would undergo an involution and return to a normal state. Undoubtedly this does take place to some extent, but as has been shown it is not a complete process.

The extent of the folding and formation of sulci in and around the base of the bladder, will depend on the degree of freedom of the separated bladder from the underlying mucosa and fascia, and also from the uterus. A free separation from the mucosa and fascia will enable the operator to coapt the fascial pillars with the minimum amount of puckering of the overlying free bladder wall. If this is associated with a free separation of the bladder from the uterus, the likelihood of the formation of puckers in and around the ureter mouths will be reduced to a minimum.

Dr. Rawls is enthusiatic in his belief that if care is exercised in preserving the fascial pillars of the bladder when separating the vaginal mucosa, and equal attention is devoted to freeing the bladder from these pillars and from its uterine attachment, equally good results will be obtained in all degrees of cystocele, not only as to the vaginal aspect, but also in a minimum of folding of the base of the bladder, if not practically in the absence of them.

This study will be continued with the hope that we may be able to settle in our own minds the essential features of the operation that will not only give a permanent vaginal restoration of the prolapsed anterior wall, but also in so doing will leave the base of the bladder in the normal plane.

THE DISTURBANCES OF ACID SECRETION ACCOMPANYING ULCER OF THE STOMACH OR DUODENUM AND THE CHANGES FOLLOWING OPERATION[1]

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THE secretion of hydrochloric acid by the mucous membrane of the stomach is a variable factor in conditions of health and when the stomach becomes the seat of chronic ulcerations the pathological changes in the secretory function represent marked exaggerations of the normal variations. This communication will describe these variations from the normal which were observed to be associated with ulcerative conditions and the changes which were seen to follow operations of one kind or another performed for curative purposes. No discussion will be made of the significance of these pathological variations either as a causative factor in the production of chronic ulcers of the stomach or duodenum, or as a criterion upon which the diagnosis of ulcer can be based.

The method of fractional estimations of the stomach contents was employed, and it was especially applicable for the reason that we wished to ascertain, not the condition of secretion at any given moment (always arbitrarily chosen), but the character and extent of the acid secretion throughout the entire digestive period. With the fractional method it is possible to obtain a correct conception of the concentration of acid at different periods

[1] From the surgical service of A. A. Berg, Mount Sinai Hospital, New York.

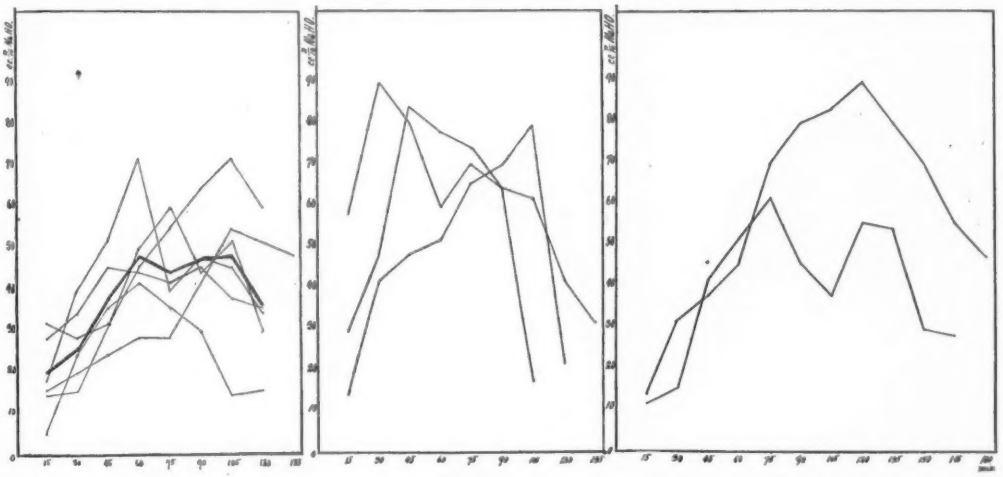

Fig. 1. Fig. 2. Fig. 3.

NOTE.—In all of the figures the ordinates indicate total acidity in terms of cubic centimeters of decinormal sodium hydrate solution; the abscissæ indicate time in minutes.

of digestion and, in addition, by means of the graphic curves, to compare the function both before and after operation. Then, too, it is possible to make comparisons at different and subsequent postoperative periods with the object of determining whether the postoperative improvement was constant and continuous or whether it was interrupted by temporary or persistent periods of deterioration of this function.

The test-meal which was employed is prepared by adding two heaping tablespoonfuls of oatmeal to a liter of water. The mixture is then heated on a water bath (double boiler) sufficiently long to reduce the total bulk to 500 cubic centimeters. All of the examinations described in this paper were made after the following manner: After emptying the stomach by aspiration of whatever content remained after the night's rest, the entire amount of oatmeal gruel is immediately ingested, following which a narrow calibered duodenal tube is swallowed and allowed to remain *in situ* until the completion of the observation. From 5 to 10 cubic centimeters were aspirated with a small syringe every fifteen minutes thereafter, and each specimen was tested quantitatively for free and total acidity. The estimations were then charted, as in the accompanying figures, in which the ordinates represent the total acidity in terms of cubic centimeters of decinormal sodium hydrate solution and the abscissæ the time intervals. For matters of convenience, only the total acidities are given in the charts.

As a general rule, because of previous experiences with stomach examinations of various kinds, the patients tolerated the tubes for the long periods necessary for the complete observation. Whenever this tolerance was not exhibited, the observation was discarded and repeated subsequently. Whenever, for control purposes, the observations were repeated on consecutive days, practically always results were obtained which showed sufficient similarities, other things being equal, to permit one to class them as identical. In several instances, however, this rule did not hold true, but at the present writing no adequate reason can be furnished for this discrepancy.

The characteristics of the normal period of digestion among the patients customarily seen at the hospital is exemplified in Figure 1. Six observations taken at random from a large number of control cases are grouped together and to these has been added a seventh curve obtained by averaging the original six. In all of these cases it was proved at exploratory

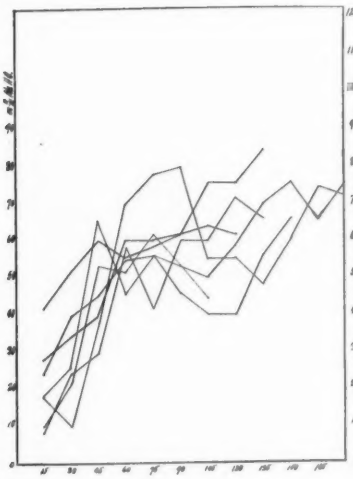

Fig. 4.

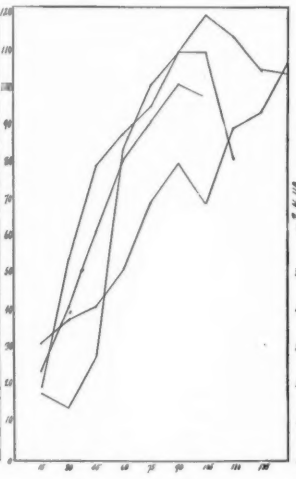

Fig. 5.

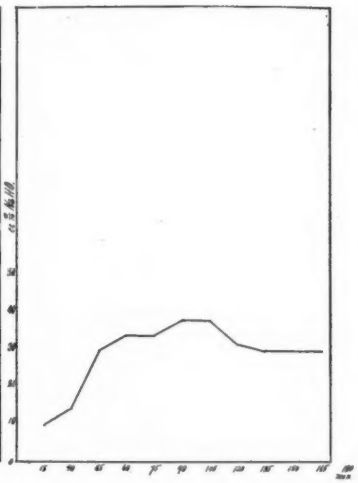

Fig. 6.

operations that no lesion of any kind existed either in the stomach or duodenum.

The special points which characterize these normal cases are:

1. There is no fasting contents, or at most, the fasting contents consist of a few (10 to 20 cc.) cubic centimeters. This is mostly mucus, more rarely a thin watery fluid and very rarely is bile tinged. It usually contains no or very little free hydrochloric acid and shows a low total acidity. Frequently, however, there is no acid content whatever.

2. Hydrochloric acid is secreted rapidly and the total concentration rises and reaches its maximum usually at approximately the end of the first hour.

3. Thereafter the total concentration of acid tends to fall and approach the level from which it began.

4. The stomach is empty after this test-meal at from 120 to 135 minutes after ingestion. Thereafter the stomach contents resembles the original fasting contents.

It has previously been taught that the total acid concentration in the stomach is a constant phenomenon and in humans usually averages about 0.2 per cent. Even a short experience with the fractional method of making stomach examinations negatives such impressions. The true conception seems to be that the concentration of acid in the stomach contents is a variable factor and depends on the chemical character and amount of the stomach contents. The degree of concentration is variable also during the digestive period and normally the latter is characterized by a primary rise followed by a secondary fall in the acid content. With carbohydrate meals it is common experience to see the acid content mount to 0.4 per cent and 0.5 per cent and with proteid (meat) meals to figures much higher than that.

The fractional method is especially valuable in furnishing this truer conception of the acid concentration in the stomach contents. Under the older methods, estimations are made at the end of an arbitrarily chosen time, usually at the end of an hour. With the fractional method, it is frequently demonstrated, however, that the highest concentration is reached at a much earlier or later period of digestion, and in pathological cases this may be as late as at the end of three or four hours.

The number of cases of ulcer of the stomach or duodenum which have been studied is to date sixty-three. In the majority of the cases the studies are complete, observations having been made both before and after operation. In a few, some of the observations are lacking, either those which should

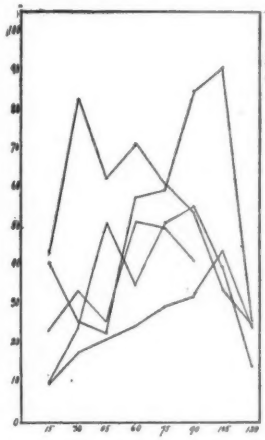

Fig. 7.

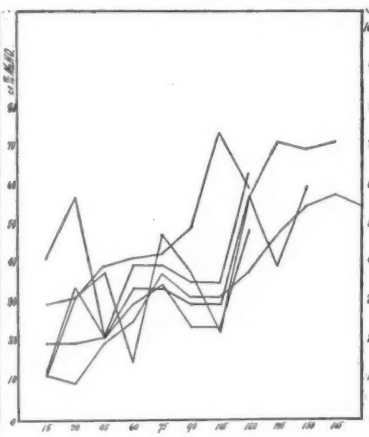

Fig. 8.

Fig. 9.

have been made before or those which should have been made after operation. The number of cases cited in each of the groups described hereafter furnishes a roughly accurate index of the relative proportions of the various disturbances actually existing among all of our cases.

ANTE-OPERATIVE STUDIES

The observations made before operation of the pathological variations of the secretory function can be classified into groups, the individual members of each group showing marked similarities. These groups are as follows:

1. A number of the cases show no disturbance in the function of hydrochloric acid secretion and are practically identical with those described as the normal controls. These were all cases of duodenal ulcer. The duration of symptoms in these patients was from two to six years. (Fig. 2.)

2. The digestive period has normal characteristics with the one exception that the period was appreciably prolonged beyond the normal length. Of the two cases cited, one had had symptoms for three months and the operation demonstrated a healed ulcer with a resultant pyloric stenosis. The other had an open ulcer on the lesser curvature and had had symptoms for eleven months. (Fig. 3.)

3. This is much the largest group. At the beginning of digestion the acid content is usually low and as digestion proceeds there is a progressive increase toward a moderately high total concentration. The secondary fall usually seen in the normal cases is missing and the stomach is emptied when its contents still have an excessive amount of acid. The length of the period varies between 120 and 180 minutes, the average being between 140 and 150 minutes.

Five of the cases cited had had symptoms for one to eight years and at operation were found to have open duodenal ulcers. Two had had symptoms eighteen months and three years, respectively, and at operation large open ulcerations in the duodenum were close enough to the pyloric ring to form a source of obstruction. In the remaining two, the ulceration had healed and stenosis had resulted; symptoms were present for two and sixteen years, respectively. (Fig. 4.)

4. The observations in these patients show marked exaggerations of the disturbance characteristic of the preceding group. The rise is progressive, rapid, and very steep. The stomach is emptied sometimes appreciably before the normal time, more often at approximately normal times and the total concentration of acid at that moment is altogether too high. (Fig. 5.)

Three of the patients had open duodenal ulcers and the symptoms had existed for eight months to six years. The fourth had

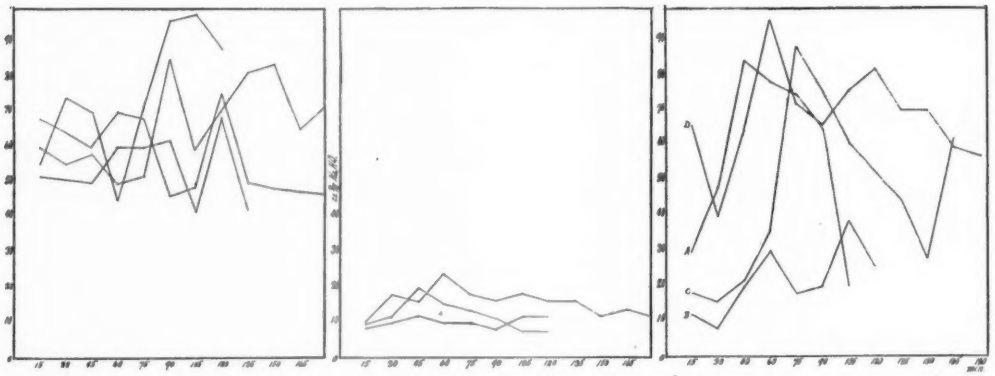

Fig. 10. Fig. 11. Fig. 12.

a pyloric stenosis and there had been symptoms for two years.

5. The subacidity cases of ulcer are relatively few in number. The ulcer in the case studied was on the lesser curvature, was moderately large, and had given symptoms for five years. (Fig. 6.)

DISCUSSION

The fundamental facts elicited from these studies are as follows:

1. Ulcerating lesions in the stomach or duodenum are not necessarily accompanied with disturbances in the normal physiology of acid secretion.

2. The situation of the lesion bears no relation to the disturbance, if any exists, nor to its character or intensity.

3. The disturbance bears no relation to the character and size of the ulceration present nor to any complicating anatomical condition, such as a stenosis,[1] which may be present.

4. The time factor bears no relation either to the disturbance in physiology or to its intensity.

5. The amount of physiologic disturbance bears no relation to the character and intensity of the subjective complaints.

The time factor which necessarily enters as an important item in this discussion is one which is not possible of mathematical precision inasmuch as in this disease it depends altogether on the statement of the patient which in turn is based on subjective symptoms. This necessarily gives knowledge only of the length of time for which there have been symptoms and not of the length of time for which the lesion had actually existed. It does not give any information as to whether all of the symptoms for all of the time had been due to an anatomical lesion or, at the beginning, to some neurogenous disturbance of physiologic function. Nor can we determine whether any other lesion, either close by, as in the gall-bladder or at a distance, as in the appendix, had not co-existed for part or all of the time and had accounted for part or all of the subjective symptoms.

There is no rule, therefore, which governs the amount of physiologic disturbance of acid secretion of the stomach and every case becomes a law unto itself. Every case deserves intensive study with the object of determining the relation of the subjective symptoms to the physiologic disturbance and to the actual lesion present and the relative value of each of the latter two elements in the causation of the patient's symptoms.

POSTOPERATIVE STUDIES

Most of the observations were made within three months after operation, the greatest majority between the fourth and the eighth

[1] There were no studies in far advanced cases of pyloric stenosis with marked dilatation for the reason that in these patients, it was not possible to carry out a complete observation. The test-meal has always been vomited within a short time after ingestion.

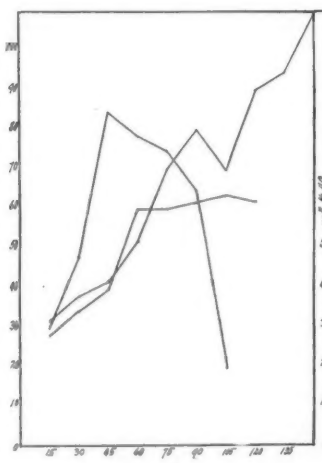

Fig. 13.

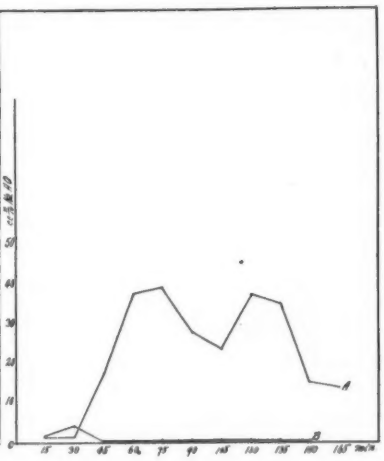

Fig. 14.

week. They include all kinds of cases; cases of ulcer of the stomach in its various usual locations as well as ulcer of the duodenum.

The operations which are employed on this service are as follows:

1. Excision of the ulcer-bearing area.

2. Excision of the ulcer-bearing area by resection in continuity of the middle segment of the stomach ("sleeve resection").

3. Gastrojejunostomy by suture or Murphy button, with and without exclusion of the ulcer-bearing area by the string method.

4. Excision of the ulcer-bearing area by pylorectomy or partial gastrectomy with the necessary gastrojejunostomy made practically always by Murphy button.

The test-meals were all given after the manner previously described. In several of the control cases observations were made after the exploratory operations. At these operations, the stomach and its neighboring attached structures were withdrawn from the abdomen through a median incision and were handled in the manner necessary for determining the presence of an ulcer or any of its complications. No exploratory gastrotomy was made. No ulcer having been found, the parts were returned into the abdominal cavity and the external wound was closed. In studying the postoperative observations in these cases no appreciable difference could be distinguished from those made before operation.

In the cases in which ulcers were found, the postoperative observations were classified and resulted in the following groups:

1. Cases in which the acid secretion corresponded to what we have recognized as the normal type. In several of the instances the total concentration was rather high but, except for that, these, too, showed normal characteristics. (Fig. 7.) The individual specimens may or may not be bile stained.

2. Cases in which the total acid concentration begins at or near the normal base line and then rises slowly to a moderate degree. The secondary fall is not present. The digestive period is between 120 and 180 minutes long, the average being between 140 and 150 minutes. The individual specimens are usually all bile stained. (Fig. 8.)

3. The amount of acid in the fasting content is usually low and as digestion proceeds it rises rapidly and reaches a high total maximum between seventy-five and ninety minutes after ingestion. Then in many of the cases there is a steep and rapid fall due to a large influx of duodenal and small intestinal contents which is again followed by a steep rise. At the time of complete emptying, the gastric contents contains a large amount of acid, much larger than is normal. The indi-

vidual specimens are practically always bile stained and the digestive period averages between 105 and 150 minutes. (Fig. 9.)

In a number of the cases it was found that the fasting content contained a large amount of acid and, when food was introduced into the stomach, the total concentration tended to remain either at approximately the same level or to go to even higher levels. At the terminal stage there was just as much acid in the gastric contents as at the beginning. In one of the cases, there was an appreciable fall at the end of digestion. The specimens were usually all bile stained. The length of the digestive period was between 120 and 180 minutes. (Fig. 10.)

5. The postoperative subacidity cases are few in number. They usually begin with a small amount of acid and run an even level throughout digestion. The specimens are usually bile stained. The length of the period averages about 130 minutes. (Fig. 11.)

In several of the cases we were able to repeat the observations a number of times at widely separated intervals after the discharge of the patient from the hospital. One of these cases is herewith described as an illustration of the sequence of events.

Hospital No. 160857. The ante-operative study is shown in Figure 12, *A*. Under our classification this must be considered as a normal observation. At the operation a duodenal ulcer was found and for its cure a posterior gastrojejunostomy was made by suture, and the ulcer-bearing-area was excluded by the string method.

The first postoperative observation was made twenty-two days after operation and is shown in Figure 12, *B*. This shows a marked lessening of the total acid concentration with a progressive rise from the beginning to the end of digestion. During the following year the condition of this function was investigated on two separate occasions and the results are shown in Figure 12, *C* and *D*.

DISCUSSION

The demonstration of a normal acid function after operation and its persistence has been found to occur most frequently in cases of acutely perforating ulcer of the stomach or duodenum.[1] There is much reason for the belief that the mechanism of acute perforation of the stomach or duodenum is in the greatest majority of the cases analogous to acute perforation of the appendix. If this premise be true it follows that physiological disturbances need not necessarily have occurred concomitantly with the perforation which then assumes the rôle of a mechanical lesion. The nature of the lesion makes an immediate operation imperative and when recovery takes place it does so quickly. No disturbance need therefore be looked for after operation and this conclusion is borne out by the clinical facts.

The cases which give the largest number of similar observations are those grouped as moderate or excessive hyperacidities. These conditions are usually seen to follow similar ante-operative conditions. The usual sequence is for the total concentration to be appreciably lowered after operation without the curve in any way losing the general characteristics of the observation made before operation. This immediate fall has, however, very frequently been followed after a longer or shorter interval by a return to the preoperative status. In a number of the cases the final postoperative acidity has exceeded that existing before operation (Fig. 12).

It is not, however, universally true that the postoperative hyperacidities follow similar ante-operative conditions and among the numerous cases which have been studied it was found that a postoperative moderate or excessive hyperacidity may follow any of the types noted in Figure 13.

This change in the postoperative hyperacidity cases is probably entirely due to the effect of the alkali introduced into the stomach through the anastomotic stoma (duodenal content). This produces an immediate fall in the total acid concentration of the stomach contents. Following physiological laws the chemical neutralization acts as a stimulus to a renewed and much increased formation of acid and finally the total content returns to its previous status or to conditions in which it may be increased even beyond the latter.

[1] Our method of treatment for this emergency is discussed elsewhere (1).

The postoperative subacidity cases followed similar ante-operative conditions. It has been the usual experience that when once a condition of subacidity has appeared it remains at that level or falls to even lower concentrations.

The nature of the operation employed seemed to have no relation to the postoperative changes in the acid secretion with the exception of those operations in which it is necessary to remove a larger or smaller segment of the pyloric part of the stomach. In several instances it was found that a condition of anacidity followed the latter type of operation (Fig. 14). It is difficult to understand this change inasmuch as the acid secreting cells are at a minimum in the resected part of the stomach.

CONCLUSIONS

The dominant features of the postoperative studies are as follows:

1. A normal secretion follows most frequently operations for acutely perforated ulcers.

2. An ante-operative subacidity usually persists after operation.

3. There is no rule which governs the sequence of events in the majority of the cases of postoperative moderate and extreme degrees of hyperacidity.

4. Resection of the stomach may be followed by conditions of anacidity.

COMMENT

It is difficult to understand in any individual case the relation of the post-operative clinical facts to the laboratory examinations noted in this communication. For it is found that subjective cures may be obtained when the laboratory examinations indicate a disturbed physiology and postoperative symptoms may appear when the disturbance of secretion seems to be improving or when the secretion is within normal limits. This is probably due to the following facts:

1. The symptoms need not necessarily be due to the disturbance of acid secretion but to the disturbance of some other function of the stomach.

2. The symptom may be pain which is due to an ulcer which has not yet undergone healing or perhaps to some entirely different lesion (2).

3. The ante-operative suffering may have been so marked that the relief obtained by operation overshadows completely any slight subjective complaint which may persist or appear.

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PERINEAL HERNIA

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IN previous studies upon the pathogenesis of hernia, I have emphasized the fact that every hernia results primarily from a defect in the intra-abdominal or pelvic fascia, which in turn is caused by the passage of either a blood-vessel or a viscus out of the abdomen. It is somewhat surprising that hernia at the outlet of the pelvis is an occurrence of such extreme rarity. When we consider that the urethra, rectum, and vagina, and a host of blood-vessels pass in and out of the pelvis, it seems strange that pelvic herniæ are not more common than they are. Indeed, after a careful search of the literature, going as far back as the 18th century, I have been able to find only 28 cases of perineal hernia reported. In order to obviate all possible argument upon this point, I may mention here, that the term perineal hernia, as used in medical literature, is somewhat of a misnomer, because most writers include under this generic name, not only those herniæ which make their exit in the perineum, or in close proximity to it, but also all the herniæ which escape from the abdomen at the pelvic outlet. The only hernia which apparently has escaped such a generalization is the sciatic hernia; and if we consider that so few of this particular variety have been observed either at operation or at autopsy, and also that clinically the differential diagnosis is so extremely difficult it appears to me to be not unlikely that one or another of the cases reported as sciatic hernia belongs in reality to the perineal group, and vice versa.

The inadequate observation, or more charitably said, the inadequate description of many of the 28 reported cases, has made it necessary for me to follow the footsteps of the majority of my predecessors in this field; namely, to accept the statements of the various writers, regarding the particular nature of the hernia at its face value. As far as it lay in my power, I have traced all cases to their original source of publication and as a result of this study I am compelled to confess that the evidence in some cases hangs by a very slender thread; so slender, indeed, as frequently to give rise to the temptation to exclude a large number. I refrained from so doing, merely because I realized the difficulties which surround the entire subject. The mixup is caused principally by the fact that the greater majority (20) of the cases reported are merely clinical observations; that very few cases only (4) were operated upon; and that only a very small minority (4) were examined postmortem. By this statement I mean to imply that in order to determine the exact pathological condition of a perineal hernia, a clinical observation, while very valuable, is not at all sufficient. Even an operation cannot be said to be entirely sufficient; as it does not, as a rule, offer the opportunity to study the detailed anatomy with that amount of care which appears to be requisite. There finally remains only the third method of study, namely, postmortem dissection, which after all is the only method that can be considered ideal. The difficulty, however, is that with the exception of Scarpa's classic case, no case has been dissected with the requisite amount of care to be beyond doubt.

Last winter through a fortunate circumstance a case of perineal hernia was referred to me for operation. This case forms the basis of this paper:

Esther P., age 2½ years, was referred to me by Doctor Schwartz of Fall River, Massachusetts. Six or seven weeks before being seen by me, the mother noticed a swelling in the right buttock. This swelling increased slightly in size during the following few weeks, but apparently it was not the cause of any discomfort.

Physical examination revealed the following: There was present in the right buttock a moderately firm, very movable swelling, which occupied, roughly speaking, the region bounded mesially by the coccyx and anus, and laterally by the tuberosity of the ischium and the gluteus maximus. The pal-

pable surface of the mass was globular and increased in size when the child cried. On manipulation the mass escaped in an upward direction, but it never disappeared entirely. The tumor caused a notable fullness of the buttock; unfortunately, however, my photographs are not good enough for reproduction. Rectal examination revealed a mass upon its right; when an attempt was made to reduce the mass the palpating finger noted that the rectal fullness increased in volume. It was impossible to determine by examination whether the hernia, for such it was taken to be, was reduced through the sciatic notch, or through a hiatus in the levator ani.

I was somewhat at a loss to account for the fact, that, no matter what the manipulation, or how frequently attempted, the hernia could not be reduced completely. Finally I arrived at the conclusion that either there existed a subperitoneal lipoma in connection with the hernia, or that the contents were adherent to the fundus of the sac: As will be seen, the former diagnosis proved to be correct.

Two methods of approach were considered, namely the abdominal and the perineal; on account of the possibility of the presence of a large subperitoneal lipoma, I finally decided in favor of the latter. The operation was carried out on May 23, 1916.

With the patient in the prone position, and with the buttocks elevated, an oblique incision about three inches in length was carried over the tumor in the right buttock. On reaching the ischiorectal fossa I encountered a long lipomatous mass, distinctly encapsulated, leading upward into the depth of the wound. At its basal attachment it had to be separated from the underlying peritoneum by sharp dissection. When this was finally accomplished, a defect in the pelvic floor was found, through which two fingers could be introduced into the abdomen as high as the pelvic brim. The finger entered through the posterior part of the levator ani, approximately just anterior to the coccygeus. On increasing the intra-abdominal pressure a hernial sac was seen to descend through this hiatus. This sac was not opened nor resected, however, as it was recognized to be too intimately adherent, posteriorly to the rectum, and anteriorly to the vagina (*hernie par glissement*). The opening in the depth of the pelvic floor was then closed by interrupted chromicized catgut sutures, and was reinforced by liberating the gluteus maximus and suturing its inferior margin to the deep pelvic fascia.

The specimen removed proved to be a lipomatous mass six inches long and two inches wide. A small portion of the peritoneal sac was adherent at its deepest attachment, and was proved to be such on microscopic examination. After primary union of the wound, the patient was discharged, June 9, 1916.

There does not exist in my mind the slightest doubt as to the correctness of the diagnosis of a perineal hernia, and yet I confess that I have not brought forward such proof that the diagnosis may be said to be beyond any doubt. In extenuation I plead that because of the smallness of the parts involved, the youth of the patient, and the lack of necessity for a more careful dissection, complete proof was not possible.

From as much information as I could gain from the operation, it appeared to me that the hernia made its exit at the seat of predilection for these herniæ, namely at the posterior border of the levator ani or better said, through the very frequent cleft between the levator ani and the coccygeus; and that subsequently the hernia burrowed a way for itself into the ischiorectal fossa. In this respect it corresponds to the picture of the classical perineal hernia, if such can be said to exist. The lipoma which accompanied the hernia is not at all an infrequent occurrence in perineal hernia. The patient was presented at a meeting of the New York Surgical Society March 14, 1917; thus far the cure appears to be radical.

As far as my studies indicate only two operations have been recorded for indubitable cases of perineal hernia.

CASE 1. Reported by Bottini (1). The patient was a female 33 years of age; the hernia was located upon the left side, was of the size of a cocoanut, and perfectly reducible. Bottini operated through a vertical incision, parallel with the ascending ramus of the ischium. (In other words the incision was not unlike the one used by me.) The hernial contents were recognized as small intestine, sigmoid flexure, the left tube and ovary. The hernial sac was extirpated, and the wound closed in layers with catgut. The wound became infected. At the time of her discharge from the hospital, there was no recurrence.

CASE 2. Reported by Thomas (2). The patient was a male 62 years of age, who four years previously, after lifting a heavy weight, noticed a rupture in the anal region. The hernia gradually increased in size up to a year ago, since which time it has remained stationary. It caused a great deal of difficulty in walking and sitting, and also during defæcation; bladder symptoms were absent. When first seen by Thomas the swelling extended as far as the posterior extremity of the scrotum. The posterior part of the hernia was reducible and evidently contained intestine; the greater part of the hernia however was irreducible, firm, elastic, and dull on percussion. At the operation which was performed in the lithotomy position, a fibromyoma weighing

2¼ pounds was extirpated. Several bursæ were present upon its surface. The patient was greatly relieved by this operation, though apparently (?) nothing was done for the hernia, and at the time of his discharge there were still present the physical signs of a hernia, such as bulging on coughing, etc.

While not proved beyond doubt, I am inclined to accept as sufficiently suggestive to be included in my list of operative perineal herniæ the following two cases. They differ from the previous cases by the fact that they were emergency operations for an intestinal obstruction, and that therefore no attempt could be made to subject the patient to more careful study. Practically all that was done, was to incise the sac of the hernia, the contents of which were strangulated bowel.

CASE 3. Reported by Harrison (3). The patient gave a history that for three months he had been complaining of an intense burning pain in the perineum, accompanied by an almost constant micturition, which he attributed to excessive horseback riding. These symptoms suddenly disappeared when the patient noticed a small tumor in that locality. When Harrison examined the patient he found a hard tumor about the size of a hazelnut, just behind the scrotum, and in contact with the bulb of the urethra. The tumor continued to increase in size, and finally encroached upon the scrotum. The patient was first seen by Harrison May 27th. By June 3, the symptoms became aggravated; the scrotum was greatly enlarged and very painful; there were recurring chills with fever. Incision of the scrotum on June 4 was followed by a discharge of pus and very offensive feculent matter. Three days later there was discharged through the wound a loop of gangrenous intestines six inches long. The wound was completely healed in 35 days.

Epicrisis. Absolute proof is lacking that this was a true case of perineal hernia; however the presumption is strong that it was such, because we find it distinctly stated in the history that the hernia first made its appearance in the perineum, and only gradually extended toward the scrotum. The fortunate outcome of the case should also be commented upon.

For similar reasons I am also inclined to include among the proved cases the following:

CASE 4. Reported by Stiegele (4). The hernia occurred in a male individual, 23 years of age, who had served for a number of years in the artillery. One day he was suddenly seized with griping pains in the abdomen, which were particularly severe in the right half of the hypogastric region. The pains persisted even after an evacuation of the bowels, and on examination a perineal hernia was found. With the exception of one small loop of intestine, most of the hernial contents were easily reduced. The pain and the vomiting persisted until the following day, when Stiegele was asked to see the patient. Again attempts at reduction were made, and these being ineffectual the patient was operated upon. In the lithotomy position a median incision was made just to the left of the raphé. A hernia was encountered, containing strangulated but viable gut, which was reduced by manipulation. The pain ceased at once, and was followed by stool. The patient was finally cured.

The four cases just enumerated are the only true cases of perineal hernia that I find recorded in the literature as having been operated upon, making a total of five cases including my own. For the sake of completeness I wish to mention in brief also the following two cases, which have been reported as cases operated upon for perineal hernia, but which for one reason or another, as is stated in the history, I have deemed proper to exclude.

CASE 1. Atkinson (5) reports a case with the title "An Unusual Form of Perineal Hernia." The patient was a premature female infant three weeks old. Nothing abnormal was noticed up to the date of admission to the hospital, when a large bleeding mass was found protruding from the vulva, between the labia. This mass was irreducible, and about 1½ inches in length, and one inch in diameter, and had a short thick pedicle. The mass projected backward covering the vaginal orifice and anus. On elevating the mass it was found that the vagina was unobstructed, and that the pedicle emerged from the urethral orifice. A probe could be passed in front of the mass into the bladder for about two inches.

The operation, which was carried out on the day of admission is, much to my regret, very inadequately described. As near as I can gather from the description, the mass was incised, and this incision immediately opened into the peritoneum, with the escape of a little fluid. The neck of the protrusion was then ligated and the mass removed; the stump retracted into the urethra. Uneventful recovery followed.

Microscopic examination of the specimen showed an outer layer of stratified epithelium, derived from either the bladder or urethra; an internal endothelial layer, presumably peritoneum, and a layer of smooth muscle fibre and connective tissue between the two.

Epicrisis. Judging entirely by the description of the case, I am inclined to exclude this case from the true perineal herniæ. It appears to me most probable that the case is one of a true prolapse of the bladder through

the urethra; the microscopical examination stamps it as such, and to my mind it does not require any further discussion.

CASE 2. Bromfield (6) relates the history of a boy, upon whom he operated for stone by perineal section. During the operation the small intestines prolapsed into the wound. These were reduced and, in spite of the gravity of the case, particularly in the pre-antiseptic era, recovery ensued.

Bromfield assumes, and is supported in this assumption by Sir Astley Cooper, that an incomplete perineal hernia existed between the bladder and the rectum, which was injured during the operation.

Epicrisis. I am inclined to exclude this case as a true perineal hernia. Accidental injuries of the peritoneum may occur in the course of any perineal section; and I am sure that everyone will agree with me that hardly sufficient opportunity is given to study the relations of the parts in question through the small incision in the perineum.

Just as many cases of postmortem observation as of operations are recorded in the literature. However, even many of these are not observed with that requisite amount of care, as to be available for the purpose of study. Fortunately for us, one of these cases was observed and studied by Scarpa, and he describes his case with such extraordinarily fine detail and masterful skill, as to stand as a model for all future observers. The case is the following:

CASE 1. Scarpa (7). The patient was a male individual, 59 years of age, and apparently afflicted with pulmonary tuberculosis. A few years before consulting Scarpa, the patient, while standing astride a small brook, with legs widely separated, and the body bent forward, suddenly felt an acute pain in the right buttock, as if something had been torn apart. Upon resuming the erect posture he discovered in the vicinity of the rectum a small lump the size of a walnut. On slight pressure this lump disappeared in the depth. Subsequently the patient was able to prevent the prolapse of this mass by a bandage. A violent cough which ensued and lasted four months, increased the size of the mass, until it reached that of an egg.

Subsequently the patient sought relief through Scarpa, and desired some kind of a supporting truss. On examination there was to be seen in close proximity to the right margin of the anus, and extending to the gluteus maximus a pear-shaped mass, the size of an egg, which gave an impulse on coughing; the contents were reducible with a gurgling sound.

Nine years later the patient was suddenly seized with pain in the abdomen, extending from the pelvis to the umbilical region; it was accompanied by dysuria and nausea, and was soon followed by vomiting and distention of the abdomen. The hernia had greatly increased in size, and was very tense and tender. On admission to the hospital, an intestinal obstruction was diagnosticated. Under conservative treatment, the obstruction was relieved with cessation of all the symptoms. A few months later the patient died from a progressive pulmonary tuberculosis.

A very careful dissection was made of the hernia and revealed the following: On opening the abdomen nothing abnormal was seen at first. When the terminal portion of the ileum was lifted up it was noted that it was evidently pulled up from a depth much greater than is normal. When viewed from within the abdomen, it was seen that the right half of the pelvis was much deeper than the left. In the depth of the right half there was to be seen also an opening, through which the peritoneum was continued to still greater depths. The opening which was evidently a hernial ring measured approximately one inch in diameter. All the pelvic viscera were pushed over toward the left.

The skin covering the perineum was not adherent to the deep structures. Directly underneath the cellular fascia there were to be seen fibers of the levator ani; the fibers were thinnest upon the top and increased in thickness upon approaching the ring. Careful examination showed that the hernia first emerged behind the transversus perinei, and was therefore located in the space bounded by the right margin of the anus, the greater sacrosciatic ligament and the tip of coccyx. As the hernia increased in size it pushed the rectum over toward the left side. Underneath the levator ani there was the hernial sac; the hernial contents were, as before stated, a loop of ileum.

But for the slight difference that my case was complicated by the presence of a lipoma upon the surface of the hernia, it appears to be practically identical with that of Scarpa.

Other cases of perineal hernia that were studied at autopsy, which I find recorded in literature are the following:

CASE 2. Chardenon (8) observed the following case in 1740. He dissected the body of a male individual, 45 years of age, who died of some acute illness, which is not otherwise mentioned. As he was removing the small intestines out of the pelvis, he felt a resistance which was looked upon as being caused by an adhesion. On close examination, however, he saw that the ileum disappeared between the bladder and the rectum. On exerting a more forcible pull, the intestine suddenly came away, and it was then seen that instead of the presumed adhesion, a

hernial sac, the size of a pigeon's egg was present. The mouth of the sac had a diameter only one-third as wide as the fundus, and had a hard callous margin. With one finger in the sac and another upon the perineum it could be ascertained that only the tegumentary structures intervened.

This case was evidently the first case of a perineal hernia observed in the male. Its description is so precise that the diagnosis of a perineal hernia cannot be doubted. This case forms a rather important milestone, because the existence of a perineal hernia in the male had been denied up to that time by the best observers, even by Chopart and by Dessault.

CASE 3. Cooper (9) found at the autopsy of a male body a long perineal pouch between the bladder and the rectum. The distal extremity of this pouch, however, did not reach quite to the skin, and, therefore, the hernia did not cause a swelling palpable superficially. Cooper looked upon this case as one of an incomplete perineal hernia; in fact, he was of the opinion (erroneously we know) that all cases of perineal hernia are incomplete.

CASE 4. Papen (10). Under the title "*De Stupenda Hernia Dorsali*" relates a most remarkable case, which was very probably a gigantic perineal hernia. It is the record of an autopsy, which was held on the body of a female, 50 years of age, who died suddenly. There was present a hernia, which was as large as a sac, and extended from the right side of the anus to the calves of the legs. The contents were the entire small intestines, the cæcum, and the appendix; the stomach, pylorus, and duodenum were adherent to the neck of the sac. The neck of the hernia was oblong, and was located between the anus and the coccyx.

The hernia had existed for ten years, and during this time had reached the colossal size aforementioned.

In Jacobsohn's (11) article "*Ueber den Mittelfleischbruch*" I found a reference to the following records of autopsies, which for valid reasons I deemed it proper to exclude. It should be added, however, that I was unable to verify the cases by looking up the original publications. They are the following: The case of Bose (12) was apparently one of sciatic hernia. The case reported by Hartman (13) was very probably a case of a pudendal hernia; a hernia closely allied to, but still not *sensu strictu*, a perineal hernia.

The rarity of perineal hernia and the number of its possible varieties, makes it incumbent upon us to be circumspect in the acceptance of cases. It is particularly on that account that I have emphasized the fact, that in the first line only well observed autopsy records should be accepted as incontrovertible proof; next in line are carefully observed operative cases; and in the third line only clinical observations without either of the preceding. For the sake of completeness, however, I have decided to add a brief abstract of the acceptable cases, as I find them recorded up to the date of this writing. They are the following:

CASE 1. Berger (14) mentions casually a case that very probably was one of perineal hernia; the description of the case is, however, too insufficient.

CASE 2. Fischer (15) reports the following case: The patient was a male individual, 46 years of age, who had been complaining since a few months of a peculiar pressure behind the scrotum, and which was particularly annoying after arduous work. On examination Fischer found a small reducible swelling in the perineum, which was looked upon as a hernia. Truss treatment.

CASE 3. Hager (16) reports the case of a patient, a female, 27 years of age, who during an attempt at lifting a heavy weight, with the legs widely separated, suddenly felt a severe pain in the perineum, followed by the appearance of a swelling to the left of the rectum. This swelling increased in size very rapidly, and when first seen by Hager, measured 16x8 inches. Subsequently, the left labium also became involved, but was separated from the swelling which first appeared by a depression, which was looked upon by the author as the transversus perinei. The hernial ring is stated to have been bounded by the tuberosity and ascending ramus of the ischium, the coccyx and the sacrosciatic ligament. The hernia was considered to be incurable and, therefore, was treated only palliatively with a huge suspensory.

CASE 4. Hayden (17) reports under the title "A Rare Case of Perineal Hernia" the following case: The patient was a female, 32 years of age. During confinement a small soft tumor appeared in the vagina, which was looked upon as a polypus. Six weeks later it had increased in size, and was diagnosticated as a perineal hernia, which had descended on the right side, between the rectum and the vagina. It was reduced with considerable difficulty, and was retained by a truss.

CASE 5. Henno (18) reports a case of a soldier, 22 years of age, who fell from a considerable height and struck upon the perineum. Four or five days later he noticed a swelling located between the tuberosity of the ischium and the anus, which greatly increased in size. The swelling was elastic and reducible and became larger on straining and coughing. By a process of exclusion Henno arrived at the diagnosis of perineal hernia. The case is, however, not proved definitely.

Jacobsohn (19) reports the following three cases:

CASE 6. The patient was a male individual, 20 years of age. The hernia, the size of an egg, was caused by a fall upon the perineum; it was most prominent in the middle of the perineum, just in front of the rectum. It could be easily reduced, in fact it disappeared in the recumbent posture; it increased in size on coughing and straining. The patient wore a T bandage for a long time, and held the hernia reduced by it; after a while it disappeared completely, and there remained only an empty cutaneous bag.

CASE 7. The patient was a male, 35 years of age. One and one-half years before being admitted to the hospital the patient fell through an opening in the floor of a barn from a considerable height; he struck on the rung of a ladder, directly upon the perineum. The scrotum was torn open, and the urethra was also injured. The accident was followed by urinary retention; attempts to pass a catheter were unsuccessful at first, but subsequently the patient began to urinate in the course of time, but the ischuria persisted. Five weeks prior to his admission to the hospital, the patient noticed for the first time a small soft swelling in the perineum, which greatly increased in size. On examination, there was found on the left side of the perineum, an ovoid swelling, which was easily reduced, but reappeared immediately on releasing the pressure. On tracing the swelling upward it was found to disappear through an opening in the perineum, which admitted a finger. The hernia evidently contained the bladder, as urine could be voided only after manual reposition of the hernia. Truss treatment was followed by a slight improvement in the symptoms.

CASE 8. Female, 42 years of age. After a precipitate labor, the patient noticed to the right of the anus a swelling the size of a pea. The patient was also suffering from tuberculosis; owing to the continuous cough the perineal swelling rapidly increased in size, so that it subsequently involved also the vagina. On examination there was found a ball-like protrusion having a diameter of about two inches. It was located on the right side, beneath the gluteus maximus, between the anus, the tuberosity of the ischium, and the tip of the coccyx. It was reducible with a gurgling sound, through an opening with resistant edges, and about one inch in diameter.

CASE 9. Koch (20) reports the following case: The patient was a male, 50 years of age, who had a huge hernia, reaching in the recumbent posture down to the knees. The hernia had existed for many years, was always reducible up to the time when first seen by Koch, when it was in a condition of strangulation, but was reduced by taxis. The bladder formed part of the hernial contents, 4½ pints of urine being obtained by catheterization, after partial reduction of the hernia. Subsequently the patient died of a second strangulation; unfortunately no autopsy was obtained.

CASE 10. Masse (21) reports the following case: The patient was a female 30 years of age, who had a hernia attached to the right half of the perineum, that was so large and pendulous that it reached the popliteal space. It was only partially reducible; the lowermost irreducible portion was looked upon as a lipoma. The case is additionally interesting from the fact that when first seen the patient was a primipara, and eight months pregnant; the subsequent delivery was normal. Patient refused operation and was discharged with a truss.

CASE 11. McGavin (22) presented before the Section on Surgery of the Royal Society of Medicine a case of perineal hernia. When the hernia was reduced, a gap admitting two fingers could be felt in the central portion of the levator ani.

CASE 12. Pipelet (23). The patient was a male, 60 years of age, who seven years ago slipped with legs widely separated; the accident was followed by severe pain in the perineum, and since that time the patient complained of a heaviness and irritation in the bladder and perineum. His chief complaint was difficulty in micturition; in fact he was unable to urinate, except when he manually compressed the perineum. Pipelet found a swelling the size of an egg in the right half of the perineum, which was easily reduced, and could be traced upward through a definite opening. Treatment with a truss relieved the patient of his symptoms.

CASE 13. Schreger (24) describes a vaginoperineal hernia. The left half of the perineum was elevated into a distinct tumor, and the corresponding portion of the vagina was also bulging. The contents were small intestine.

Smellie (25) reports the following two cases:

CASE 14 was that of a female who had a hernia to the left of the anus, which disappeared in the recumbent position, but reappeared immediately upon arising. During one of her confinements, the hernia became strangulated, but on being poulticed the strangulation was relieved, with reduction of the hernial contents. At a second confinement the hernia again became strangulated, but Smellie ruptured the membranes and thus was enabled to hold the hernia back.

CASE 15 was that of a female who shortly after confinement noticed a small hernia upon the left side, which increased in size. In the eighth month of a second pregnancy the hernia became strangulated. Smellie was compelled to incise the hernia, and evacuated a large quantity of purulent material, subsequently fæces also discharged through the wound, but ultimately the patient recovered.

CASE 16. Wolff (26). The patient was a female 36 years of age, who, while loading hay onto a wagon, with legs widely separated, suddenly felt a pain in the nates, and on palpating the region felt there a swelling of the size of a walnut, which rapidly increased in size. It was reduced through an opening

located between the tuber ischi, vagina, and rectum. It increased in size, until it finally reached down to the popliteal space, and had to be supported by a sort of a suspensory bag.

For the reasons that just as the autopsy records of the cases of Bose and of Hartman, they are most probably cases of pudendal, or better said, subpubic hernia, I am inclined to exclude from the accepted cases of perineal hernia the following three clinically observed cases, which are occasionally reported as true cases of perineal hernia. They are the cases reported by Curade (27), Mery (28), and von Winckel (29).

There is one further case that occasionally masquerades among the perineal herniæ, and that is the case of LaCoste (30). I have deemed it best to exclude this case entirely; a careful study of this case makes it very probable to me, that the case was not even a hernia, but some form of a sacral meningocele.

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HEPATITIS; A CONSTANT ACCOMPANIMENT OF CHOLECYSTITIS[1]

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DURING the past year I have been greatly impressed by the frequency with which an enlarged liver is found associated with inflammation of the biliary tract. So often have the two conditions been present simultaneously that it seemed as if the observation of their association by clinicians and pathologists must have been a frequent one. The literature, however, and particularly the textbooks, deal so scantily with the subject that the impression is gained that only in a small proportion of cases of biliary tract disease is there an enlarged liver. In fact, it has been impossible to find that any careful study of the liver has ever been made in cases of biliary tract infection, except for those associated with abscess formation and the condition of so-called "biliary cirrhosis." Curiosity as to the origin and nature of the hepatic enlargement, when no abscess was present, led to the excision of pieces of the liver for microscopical and bacteriological study during the course of the operation on the gall-bladder or bile-ducts.

The study of the excised tissue in conjunction with the observation of the conditions present in the extrahepatic biliary tract and the clinical aspects of the various cases has resulted in the establishment of certain very interesting and apparently very important facts. These may be epitomized as follows: (1) In cases of acute or subacute cholecystitis there has been constantly found in the liver microscopical evidence of inflammation. (2) The hepatic inflammation is characterized by leucocytic infiltration of the interlobular, or periportal, sheaths; in the more severe types of inflammation the infiltration may involve also the parenchyma at the peripheries of the lobules and be associated with more or less œdema, slight necrosis, and moderate fat infiltration. (3) Cultures from both the liver tissue and from the bile in the gall-bladder have usually revealed the same organism in each case. (4) In chronic cholecystitis, sections of liver tissue often show a picture practically identical with that of an early case of cirrhosis. (5) The inflammatory reaction in the liver is apparently chiefly a pericholangitis. (6) The gross enlargement of the liver is probably usually due chiefly to œdema. (7) Generally the liver will subside to normal dimensions after sufficient time has elapsed following appropriate surgical treatment, although in some of the more chronic cases only a marked diminution in size has occurred after nearly a year instead of a complete return to normal dimensions.

LITERATURE

A study of the literature on enlargement of the liver in association with disease of the gall-bladder reveals the following:

Riedel (1) in 1888 called attention to the frequency with which disease of the gall-bladder is accompanied by a tongue-shaped extension of the part of the liver lying under the cartilages of the tenth and eleventh right ribs. He regarded this process as a result of biliary disease; for he considered that this partial extrusion of the liver from its normal space must be due either: (1) to a narrowing of the space, or (2) to an enlargement of the liver, and that, in the absence of conditions which would induce a narrowing of the space, it was more reasonable to assume that the liver had become enlarged as a result of biliary tract disease. Since Riedel's article was published this tongue-like process of the liver has frequently been called "Riedel's lobe."

There is, however, a conspicuous lack of agreement in the literature concerning the frequency of association of an enlarged liver with biliary tract disease and concerning the nature of the hepatic hypertrophy. Kehr (2) quotes Langenbach as saying that an enlargement of the liver is present only with obstruction of the common duct; and, on the other hand, he quotes Fink as considering prac-

[1] Read before the Chicago Surgical Society, December, 1917. (For discussion, see p. 575.)

tically every case of biliary tract infection to be associated with liver swelling. Kehr himself, however, thinks that an enlargement of the liver is present in 15 to 20 per cent of cases of cholecystitis, viz., in those with cholangitis. Mayo Robson (3) states that in infective cholangitis, the liver is not at first enlarged but later may be considerably enlarged, that among the complications are diffuse hepatitis, cholecystitis, etc., and that in suppurative cholangitis," there is usually progressive enlargement of the whole liver which may descend as low as the umbilicus." Quincke (4) remarks that in cases of cholelithiasis the liver is, as a rule, distinctly enlarged, due perhaps to stasis of bile, or, in the case of women, to the effects of lacing.

Riesman (5) mentions the occurrence of Riedel's lobe in cases of enlarged gall-bladder with stone in the cystic duct. He also states: "Cholecystitis sometimes occurs in women of advanced years who never have had any gall-bladder trouble before. As I have seen it, the attack has always followed a gross indiscretion in diet, and during the first day or two has resembled ptomaine poisoning. The symptoms are sudden epigastric pain with nausea and vomiting, prostration, and moderate fever. On the second or perhaps the third day an enlargement in the liver region with great tenderness on pressure can be made out. *This enlargement is evidently the swollen gall-bladder.*" [1]

It is evident from all this that there is a very wide divergence of opinion in the clinical literature concerning both the frequency of the enlargement of the liver and the nature of the tender mass which is so commonly felt in the right hypochondrium in cases of cholecystitis. There is no doubt, of course, that in many cases an enlarged, tender gall-bladder can be felt; but it will be shown in this paper that the tenderness elicited and the palpable mass are often due to the presence of an enlarged inflamed liver.

TYPES OF ENLARGED LIVERS

In the last 30 cases of biliary tract disease which have come under my observation at operation, there has been observed a distinct enlargement of the liver in 26, or in 87 per cent. In the remaining 4 cases there has been definite gross evidence of previous or existing pathological change in the liver other than an enlargement. The differences presented in the gross appearance of the various livers observed allow a rough classification into three main types: (1) the large, soft, œdematous liver with rounded edge which occasionally is present at a level as low as the anterior superior iliac spine; (2) the firm liver with a sharp edge and a moderately cirrhotic consistence with slight enlargement or moderate atrophy; (3) the liver of normal size, or but slightly enlarged, which appears to present features both of a moderate cirrhosis and an acute œdema. Of these three types, the first is by far the most common and is most likely to be seen in those patients whose histories and clinical findings indicate a relatively acute and recent process. The second type is encountered most often in the cases which present histories of having had repeated attacks of biliary disease extending over a period of many years; and the third type is met with in cases which, like Type 2, present histories of many years of gall-bladder or bile-duct disease but which come to operation soon after an acute attack. The hypertrophy has been most conspicuous in the right lobe, but the left lobe also has frequently been found to be enormously enlarged. The color of the liver is usually dark red. When the cirrhotic changes are marked it is usually slightly more brown. In none of the cases of this series was it cream colored, or did it indicate extensive fatty changes.

MICROSCOPIC FINDINGS

The *microscopic findings* are characteristic and are almost always of the same type, differing in individual cases only in degree. They may perhaps best be summarized in the term pericholangitis. Collections of leucocytes are scattered about in the interlobular tissue. Usually they consist chiefly of small round cells with a few polymorphonuclears and plasma cells. The number of polymorphonuclears is, of course, largely determined by the acuteness of the process. In cases, which at the time of operation have

[1] Italics mine.

fever and a leucocytosis, relatively more polymorphonuclear leucocytes are to be found. It is not infrequent also in such cases to find that the inflammatory process is not confined to the interlobular sheaths but extends through the parenchymatous tissue of the lobule from the periphery inward. When sections are carefully examined with the high power it is seen that the inflammatory process is chiefly confined to the regions immediately surrounding the finer divisions of the bile-ducts and that even when the leucocytic infiltration has invaded the parenchyma it is still apparently the intercellular bile capillaries that are most extensively involved by the surrounding inflammation. The parenchymatous cells themselves show but little change, except for an apparently œdematous condition, as indicated by their swollen and slightly granular appearance. It is rare to find fat vacuoles to any considerable extent. Necrosis, when it is present at all, is limited to small areas and is usually at the periphery of the lobule.

In the more chronic cases, those which conform to Type 2, rather extensive changes are commonly found; these consist chiefly of an increase in the amount of connective tissue in the interlobular sheaths and particularly around the small bile-ducts. Apparently also this increase is accompanied by an actual diminution in the size of the lobule so that the changes of a well marked cirrhosis are evident. The Type 3 cases microscopically show, as would be expected, evidences of an acute inflammation in addition to well marked cirrhotic changes. Pieces of tissue which have been removed immediately adjacent to the gall-bladder show slightly more extensive inflammatory changes than do those which have been taken at a distance of a couple of inches away from the gall-bladder site, especially if the cholecystitis is very acute and is accompanied by much pericholecystitis. But yet the difference is not so striking as might be supposed.

BACTERIOLOGICAL FINDINGS

Cultures have been made in ten cases both from the piece of liver removed and from the bile. The piece of tissue to be cultured was dropped, under aseptic precautions, into a flask of broth and macerated with a sterile glass rod. It was examined after 24 hours, incubation, and if a growth was present, subcultures were made on plain and blood agar and later carried through additional suitable media for identification. Cultures from the bile were made in essentially the same way by inoculating bile directly into flasks of broth. In one case no growth was obtained from either the liver or bile, and in one case growth was obtained from only the bile. In the remaining eight cases growth of the same organism or organisms was found in cultures of both the liver and bile. The colon bacillus was obtained in pure culture both from the liver and the bile in five cases. In one case it appeared in association with a streptococcus from both the liver and bile; and in one case it was found in pure culture from the bile alone. In two cases a streptococcus was obtained in pure culture from both the liver and the bile. Of the two cases which yielded a streptococcus, one was a severe empyema of the gall-bladder associated with three large stones, and the other was a case of simple cholecystitis without stones, in which the gall-bladder wall was moderately thickened and adherent to the duodenum. In this latter case symptoms of soreness and tenderness had been present in the region of the gall-bladder for about six months. There had never been a severe acute attack of pain. The liver was found to be markedly enlarged and soft and to show microscopically more than the usual number of polymorphonuclear leucocytes for a case which was unaccompanied by fever, leucocytosis or other evidence of acute exacerbation. There was no evidence of ulcer of either the stomach or duodenum. Of the five cases in which the colon bacillus was obtained in pure culture both from the liver and the bile, three were associated with stones, one had a deposit of fine sand-like material in the gall-bladder and the other presented a thickened gall-bladder with numerous adhesions and thick, very viscid, light green bile. The case in which the colon bacillus was accompanied by a streptococcus had multiple small stones in the gall-bladder. The organisms which were considered to be colon bacilli were gram-negative, slightly motile bacilli

which produced indol, formed gas in dextrose media and acidified milk. Those which were identified as streptococci were gram-positive cocci arranged in small chains which acidified milk. No attempt was made to distinguish them sharply from pneumococci, since the object sought was to determine that the organisms from the liver and bile were identical rather than to identify them positively as a certain type of organism. As a further check on the conclusion reached that a given organism was actually an infective agent, agglutination tests were made with the patient's serum on the bacteria isolated from both the liver and the bile in several cases. In one case a colon bacillus obtained from both liver and bile was agglutinated by the patient's serum in a dilution as high as 1 to 80, and in another case in a dilution as high as 1 to 40, whereas normal serum agglutinated both strains in a dilution only as high as 1 to 10. In the one case in which the isolated streptococcus was tested with the patient's serum, unsatisfactory results were obtained. It was felt, however, that the findings with agglutination tests on the colon bacilli were sufficiently conclusive to justify the statement that in each case not only were the two strains of colon bacilli isolated respectively from the bile and the liver, identical, but that they were also infecting agents.

METHOD OF OBTAINING PIECE OF LIVER FOR EXAMINATION

The method of obtaining a piece of liver for examination was to remove a small wedge from the edge of the liver. This piece has been taken sometimes near the gall-bladder and at other times at a distance of a couple of inches away from it. Invariably the piece has been removed from the right lobe. It would probably be interesting to compare a piece removed from the left lobe with one taken from the right lobe in a given case in order to compare the findings in the piece obtained from a region so far away from the gall-bladder with one nearer to it. As yet this has not been done. The hæmorrhage was always easily controlled by drawing the cut edges together with one or two catgut sutures. After removal the piece was divided, one part being used for culture and the other for microscopic examination. That it is not a dangerous procedure to remove a small piece of liver in this way is shown by the fact that there has not been a fatality in this series.

Several illustrative cases may be summarized as follows to show the characteristic features under discussion:

CASE 1. Mrs. B., age 52, housewife. Complaints: pain under right costal arch, pain in right lower quadrant of abdomen, bloating, constipation, vomiting, backache and pain in right shoulder. During past 20 years she had had about ten attacks of pain in the right lower quadrant, sometimes accompanied by vomiting and fever. Pain had been present under the right costal arch for about two years but not constantly present. It had been absent for as long as three months at a time. She had had several severe attacks of pain in this region, which on three occasions had required hypodermics for relief. The last one was two weeks before. The pain was reflected to the right shoulder and spine. There had never been jaundice. At times of severe pain she was nauseated and vomiting occurred. She thought she had had no fever with these attacks. She was the mother of one child. Previous illnesses were diphtheria at 12, spinal meningitis at 18, erysipelas at 30, repeated attacks of tonsillitis for which the tonsils were removed, at 31. Otherwise the history was of no special importance.

Examination revealed a very well-nourished woman. The head, neck, and chest showed nothing of significance. In the abdomen there was rather marked tenderness under the right costal arch. On deep inspiration palpation revealed what seemed to be either the edge of the liver or an enlarged gall-bladder descending to a distance of about three fingers' breadth below the costal margin. There was moderate tenderness in the appendix region. Otherwise the physical examination was negative except for an old perineal laceration with a cystocele and rectocele and a small urethral caruncle. The urine was normal except for a moderate number of leucocytes. The blood count showed 95 per cent hæmoglobin, 4,630,000 red cells and 7,100 leucocytes. An examination of the stomach contents showed on two occasions after test breakfasts a reduced acidity, once free hydrochloric acid of 7 and at another time no free hydrochloric acid, with total acidities of 27 and 20 respectively, but with a moderate amount of intimately mixed mucus. There was no blood in either the stomach contents or the stools. A diagnosis was made of chronic cholecystitis and appendicitis.

At operation, under ether anæsthesia, a right rectus incision was made which was extended inward at the upper margin, parallel and close to the costal margin. The gall-bladder was found to have a greatly thickened wall and to be gray instead of dark blue in color. It was adherent to the pylorus,

the colon, and the duodenum. It extended nearly a hand's breadth below the costal arch but was not distended. The liver was large and extended about three fingers' breadth below the costal margin. It was of normal color but very soft and œdematous. The edge was round rather than sharp. After separating the gall-bladder from its adhesions, an enlarged gland was found at about the beginning of the cystic duct. The gall-bladder was removed from below upward by first identifying the junction of the cystic and hepatic ducts by dissection of the hepatoduodenal ligament, doubly clamping and dividing the cystic duct and then stripping up the cystic duct and gall-bladder from their peritoneal attachments. The stump of the cystic duct was swabbed out with strong carbolic acid, transfixed and ligated with catgut, after being careful to see that the cystic artery was included in the ligature. The peritoneum was then closed over the old bed of the gall-bladder with catgut. The appendix was removed in the usual way and the stump inverted with a pursestring suture of catgut. A careful examination of the stomach, the duodenum, and the pancreas revealed nothing abnormal. A small piece of the right lobe of the liver about two inches to the right of the gall-bladder was removed for bacteriological and histological examination. The gall-bladder was opened and found to contain thick bile with a sediment of very fine, sand-like substance deposited on the surface of the mucosa. The mucosa was markedly congested and presented the appearance of the so-called "strawberry gall-bladder." The appendix was about three inches long. It was free from adhesions, but evidence of a chronic recurrent appendicitis was presented in a fibrous tip with obliteration of the lumen for about a half inch, thickened walls, and the presence of a few punctate hæmorrhages in the mucosa. The urethral caruncle was cauterized. The total duration of the operation was one hour and fifteen minutes. The postoperative course was uneventful. The patient was up walking around on the thirteenth day and left the hospital on the nineteenth day.

Cultures from both the liver and the bile in the gall-bladder revealed a colon bacillus in pure culture. Both of these organisms were agglutinated by the patient's serum in dilutions of 1 to 40, whereas normal serum agglutinated them only in dilutions of 1 to 10. It was intended also to make cultures from the wall of the appendix but through a mistake this was not done.

Histologically the liver presented a striking picture. Many areas of leucocytic infiltration could be plainly seen with the low power. The larger areas of infiltration were confined to the interlobular tissue, but occasionally a small collection of leucocytes could be seen within the liver lobule. Under higher power it was evident that the infiltration was more marked around the small bile-ducts rather than around the blood-vessels. The cells present included large numbers of polymorphonuclear leucocytes, a few plasma cells and the remainder small round cells. The parenchymatous cells were enlarged, granular and spheroid instead of cuboid, indicating an œdema of the parenchyma. Fat vacuoles were rarely visible. There was no necrosis and no increase of connective tissue. Figure 1 is from a low power photograph which shows the leucocytic infiltration in the interlobular or periportal structure. Figure 2 was made from a higher powered microphotograph. The infiltration of polymorphonuclear leucocytes around a small bile-duct is clearly shown at *a;* at *b* a similar but smaller infiltration is seen around what is apparently a bile capillary (or space). The parenchymatous cells are seen to be large and spheroidal instead of cuboidal.

Summary. History of pain in gall-bladder region for two years. No jaundice. No fever with any of the attacks. Operation disclosed an enlarged, œdematous liver with a gall-bladder whose thickened walls were adherent to other viscera. A sand-like deposit on the mucosa of the gall-bladder. Despite the absence of fever, leucocytosis or other evidence of acute inflammation the liver showed an extensive inflammatory process in which even polymorphonuclear leucocytes were playing a prominent part.

Case 2. Mrs. W., age 72. Indefinite symptoms of upper abdominal and epigastric distress for about 10 years. For last six months she had had more discomfort than usual, which had been characterized by soreness and more definite localization of pain in region of right upper quadrant. She had been practically bedridden for the past two months and had lost approximately 10 pounds in weight. She had had occasional attacks of vomiting, and recently on two or three occasions it had been necessary for her physician to administer a hypodermic because of severe colic-like pain in the region of the gall-bladder which was also referred to the right shoulder. There had never been jaundice. There was no history of typhoid. She was the mother of three children who were all living and well at the time of her entrance into the hospital.

On examination the patient was found to be a very feeble old lady with marked signs of senility and in a very poor state of nutrition. A large mass in the upper right quadrant of the abdomen was evident on inspection; and on palpation this mass was found to be firm, slightly tender and to descend on deep inspiration to as low as the umbilicus. Cardiac dullness extended 2 centimeters to the left of the mamillary line; there was marked arrhythmia and the systolic blood pressure was 170 millimeters. The temperature was 98.4°, the pulse 90, the leucocytes 5,900, the urine normal. X-ray examination showed a large pear-shaped mass extending downward from the liver shadow to nearly the umbilicus. This mass corresponded to the mass discovered on physical examination. It seemed probable that the mass was an enlarged gall-bladder with obstruction at the cystic duct. Operation was advised but a very doubtful prognosis was given because of the patient's extremely feeble condition with her asso-

ciated myocarditis, etc. At operation, which was performed under light ether anæsthesia, the mass was found to consist chiefly of a greatly enlarged right lobe of the liver (Riedel's lobe). On the under surface of this lobe was found the gall-bladder which was not distended but whose walls were greatly thickened and were adherent to the colon and duodenum. A large stone was felt in the gall-bladder. Because of the patient's condition, it was considered safer merely to separate the adhesions, to remove the stone and to drain the gall-bladder rather than remove it. This procedure was carried out; and in addition a small piece as usual was removed from the right lobe at a distance of about two inches to the right of the gall-bladder. The total duration of the operation was 30 minutes, and the patient withstood it very well. On the fourth day after the operation she complained of great pain over the heart, her pulse became rapid and of poor quality and rather marked dyspnœa occurred. The dyspnœa continued for three days. Otherwise the convalescence was entirely satisfactory. She was discharged from the hospital on the nineteenth day.

Cultures were made from both the piece of liver and the bile. From both sources a colon bacillus was isolated in pure culture. The two organisms were indistinguishable both in morphology and cultural characteristics (see Figs. 5 and 6). Both organisms also were agglutinated by the patient's serum in dilutions of 1 to 80, whereas normal serum induced agglutination in concentrations no weaker than 1 to 20. Cultures were made from the bile issuing from the drainage tube on three different occasions and each time the colon bacillus was found, once as late as 10 days after the operation.

Histologically, the liver showed many of the same features as described in Case 1. These consisted for the most part of an infiltration of the interlobular or periportal tissue with small round cells, small numbers of plasma cells and polymorphonuclear leucocytes. The polymorphonuclear cells were fewer in number than in Case 1. Again, the cellular infiltration was seen to surround chiefly the finer bile-ducts, and the parenchyma was only very slightly affected.

Summary. History suggestive of gall-bladder trouble for ten years. No jaundice. No fever and no leucocytosis. An enlarged right lobe of the liver. A single large stone in the gall-bladder. Pure cultures of colon bacillus obtained from both liver and bile which were agglutinated by patient's serum in dilutions of 1 to 80.

CASE 3. Mrs. C., aged 28. History of soreness and discomfort in right upper quadrant of abdomen for three years. This soreness occasionally radiated through to the back and the right shoulder. There had been a few attacks of rather severe colic-like pain during the past two years but for none of them did she have a hypodermic. There had never been jaundice. She had not vomited during any of the attacks of pain, and she did not think she had had any fever. She was the mother of two small children, the youngest three years old. There was no history of previous typhoid. Examination showed a moderately well-nourished woman. The head, neck, and chest were negative except for a slight amount of pyorrhœa. The edge of the liver could be felt distinctly about two fingers' breadth below the costal arch on deep inspiration, and it was distinctly tender. An X-ray examination revealed the enlargement of the liver, but was negative in regard to the gastro-intestinal tract. The urine was normal. The leucocytes were 7,950. The maximum temperature before operation was 99°.

At operation the liver was found to extend about two fingers' breadth below the costal arch. The edge was rounded and soft. The gall-bladder externally appeared normal, and there were no adhesions about it. After opening it the bile was found to be very thick and dark, almost black. No stones were present. Exploration of the rest of the abdomen, including the stomach, duodenum and pancreas, was negative except for an appendix which presented slight evidence of a chronic inflammation. A piece of the right lobe of the liver about an inch to the left of the gall-bladder was removed in the usual way, a drainage tube was inserted into the gall-bladder and secured with a pursestring suture, and the appendix was removed. The total duration of the operation was twenty-five minutes. The post-operative course was uneventful. The tube was removed on the fourth day, and the patient left the hospital with the sinus closed on the eighteenth day.

Cultures from both the piece of liver and from the bile yielded a pure culture of a streptococcus. Histologically the liver showed much the same changes as have been described in connection with the other cases. The areas of leucocytic infiltration, however, were smaller and showed comparatively few polymorphonuclear cells.

Summary. History suggestive of mild gall-bladder infection over a period of three years. Never any severe attacks. Enlarged, œdematous liver extending about two fingers' breadth below the costal arch. No stones. Bile very thick and tarry. Streptococcus isolated from both liver and bile in pure culture. Areas of leucocytic infiltration around the finer branches of the bile-ducts in the liver.

CASE 4. Mrs. S., aged 24. History of sudden attacks of severe cramp-like pain in the right hypochondrium, associated frequently with nausea but seldom with vomiting. These attacks began about two months ago while the patient was about eight months pregnant. In all she had had about five attacks, but soreness was present almost constantly between the severe attacks. She had never been jaundiced. She thought she had had fever during some of the severe attacks. She also complained of pain in the right lumbar region and the passage at times of milky urine. The pain in the loin was at times spasmodic and radiated downward toward the bladder. Blood or stones had never been observed in the urine. She also complained of incontinence of both fæces and gas because of a complete perineal

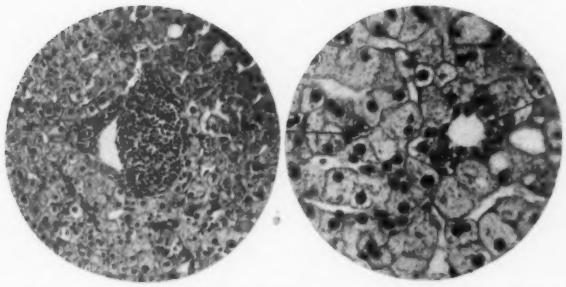

Fig. 1 (at left). Case 1. Interlobular leucocytic infiltration of liver.

Fig. 2. Case 1. *a* Shows polymorphonuclear leucocytes collected around a small bile vessel in the liver. At *b* are a few polymorphonuclear cells around a bile capillary. Parenchymatous degeneration of the liver cells and a few fat vacuoles are evident.

tear at the time of the birth of her child. Although this tear was repaired at the time by her physician, the stitches failed to hold and she now had complete incontinence. The child died a few hours after birth, and since then the patient had been in bed continuously.

Examination showed moderate tenderness over the entire right side of the abdomen and the right loin. The abdominal muscles on the right side were rigid and palpation was difficult. Nothing definite could be felt in the nature of an enlarged kidney, a mass of any kind, etc.; but marked tenderness was elicited under the right costal arch on deep inspiration. The urine contained a small amount of pus from which a colon bacillus was isolated in pure culture. A cystoscopic examination, including catheterization of the right ureter with a thorium injection (by Dr. N. G. Allcock), showed a kink in the ureter about three inches below the renal pelvis. The functional test was normal. X-ray examination also was normal except for the kink in the right ureter revealed by the thorium injection. The leucocytes were 10,500 and the temperature 99.6°. The next day after the cystoscopic examination she had a sudden severe attack of pain in the right upper quadrant associated with a slight chill, nausea without vomiting, and marked tenderness in the region of the gall-bladder. The temperature ascended to 101° and the leucocytes to 12,000. A diagnosis was made of an acute exacerbation of a chronic cholecystitis and of a slight kink in the right ureter without hydronephrosis but with slight pyelitis.

Operation was performed on the gall-bladder two days later, after the maximum temperature had decreased to 99°. The liver was found to be large and very soft. The edge was rounded rather than sharp and came down to a level of two inches below the costal arch. The gall-bladder was slightly larger than normal but was not distended. Its walls were thick and of a pale gray color, rather than of the normal bluish tint. There were no adhesions to the gall-bladder, but many small stones could be felt through the walls. The gall-bladder was removed in the usual way and found to contain about one hundred small stones with thick tarry bile. Cultures of the bile showed a pure culture of the colon bacillus. A piece of the liver was removed, practically at the site of the gall-bladder. The rectovaginal fistula was repaired after the removal of the gall-bladder. The total duration of the operation was one hour and twenty minutes. The postoperative course was normal. At the time of her discharge from the hospital, three and one-half weeks after the operation, she was feeling perfectly well, had gained approximately 10 pounds in weight and could control her bowel movements perfectly. The urine no longer contained pus and she was free from all pain and soreness in both the right loin and the abdomen.

Examination of the piece of liver removed revealed the same type of changes which have been described in connection with the other cases. When seen with the low power of the microscope, numerous collections of polymorphonuclear leucocytes and round cells were evident. These were distributed chiefly around the branches of the bile-ducts. Cultures from the bile revealed a colon bacillus in pure growth. Cultures were not made from the liver, and no agglutination tests were made with the patient's serum on the organism recovered from the bile.

Summary. Young woman presenting history of distinct attack of gall-bladder trouble while eight months pregnant. Several subsequent attacks. Examination made about one month after birth of her child showed distinct evidence of gall-bladder disease and slight kink in right ureter. At operation a markedly enlarged liver was found with many small stones in the gall-bladder.

Case 5. Nick F., aged about 45. Greek laborer. Brought into hospital moribund with no history obtainable. Death about two hours later. At autopsy performed about an hour after death, a greatly enlarged liver was found of which the lower

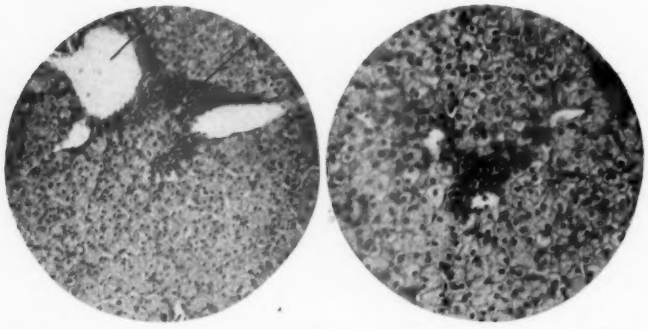

Fig. 3 (at left). Case 2. Slight infiltration of leucocytes at *a* in interlobular tissue of liver. Large interlobular veins designated by *b*. At *c* is seen a central vein.

Fig. 4. Case 3. Interlobular leucocytic infiltration of liver.

edge was as low as the crest of the ilium. It was brownish red in color, very œdematous, and had a rounded edge. The gall-bladder wall was thick and was adherent to the transverse colon and the pylorus. Thin black bile and a deposit of fine sand-like material were found in the gall-bladder. Permission was obtained to examine only the abdominal contents, and the cause of death was not positively ascertained. A piece which was removed from the right lobe of the liver at a distance of about three inches to the right of the gall-bladder site, showed very extensive leucocytic infiltration with polymorphonuclear leucocytes. This infiltration involved not only the interlobular tissues but the parenchyma as well. Cultures were not made since embalming fluid had already been put into the abdominal cavity.

CASE 6. Mrs. A., aged 50. History of epigastric distress at irregular intervals for about fifteen years with occasional attacks of severe pain in right hypochondrium, radiating to the right shoulder. In only one of these attacks had vomiting occurred. Jaundice had never been present. She had never indulged in alcoholic drinks. Typhoid history absent.

Examination showed a moderately well-nourished woman with definite tenderness under the costal arch on deep inspiration. X-ray showed shadows suspicious of a thickened gall-bladder. Temperature 98.8°. Leucocytes, 8,600. Urine normal. Operation revealed a very firm liver of cirrhotic consistence and of a brownish color. It had a firm sharp edge and was slightly smaller than a normal liver. It did not project below the costal arch but it could easily be pulled downward for a distance of about an inch when traction was made on the gall-bladder. The gall-bladder walls were thickened and were adherent to the pylorus and colon. The spleen was unusually firm but of about normal size. There was no ascites. The gall-bladder was removed in the usual way and was found to contain six medium sized facetted calculi which were light in color and soft. The bile was thick and dark green. A piece of liver was removed in the usual way about one and a half inches to the right of the gall-bladder site. It was observed that the liver cut with increased resistance. The appendix was markedly atrophic but was removed in the usual manner. The total duration of the operation was fifty minutes. The postoperative course was uneventful, and the patient was discharged on the fifteenth day.

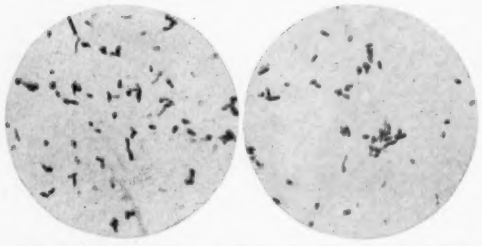

Fig. 5 (at left). Case 2. Colon bacillus obtained from liver.

Fig. 6. Case 2. Colon bacillus obtained from bile in gall-bladder.

The microscopical examination of the liver revealed most interesting changes. These consisted essentially of a very marked thickening of the walls of the finer bile-ducts and of the interlobular tissue in general. The lobules were much smaller than normal so that with the low power objective there were always two or three lobules in the field. As a whole the picture was very suggestive of a moderately advanced atrophic cirrhosis with atrophy of the lobules, although the connective tissue increase was more conspicuous around the bile channels than around the branches of the portal vein. At the peripheries of the zones of increased connective tissue, there were often found small collections of round cells, sometimes containing a few plasma cells.

Summary. Gall-bladder history extending over a period of fifteen years, with an entire absence of

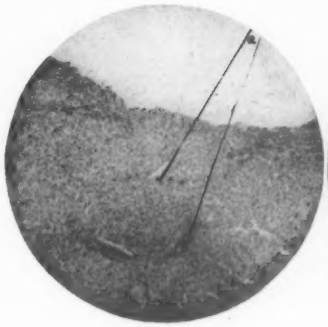

Fig. 7.

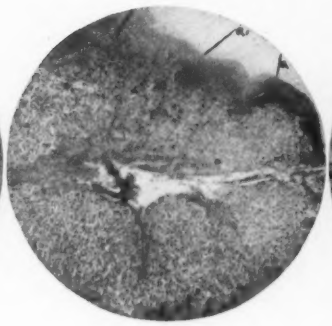

Fig. 8.

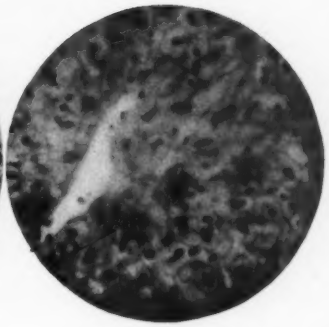

Fig. 9

Fig. 7. Case 4. Areas of leucocytic infiltrations are seen at *a*.

Fig. 8. Case 4. Higher power of Fig. 7, showing extensive inflammatory changes at the edge of the liver, *a*, and multiple areas of leucocytic infiltration, which are designated at *b*.

Fig. 9. Case 4. Still higher power, showing areas of leucocytic infiltration at *a*.

jaundice or any other symptom indicative of obstruction of the bile-tract. At operation there were found a slightly atrophic liver which was firm with a sharp edge and cut with increased resistance, a thickened gall-bladder containing calculi and numerous adhesions between the gall-bladder and adjacent structures. Microscopically, the finer bile-ducts were found to be surrounded by a marked hyperplasia of connective tissue and the lobules were atrophic. The liver in this case corresponded with that described above under Type 2.

Case 7. Mrs. G., aged 51. History of "indigestion," for about three years with several attacks of severe pain in right hypochondrium accompanied by nausea and vomiting. The last attack of moderately severe pain occurred three weeks ago and was diagnosed by her physician as probable gall-stone colic. During this attack her maximum temperature was 100°. On entrance into the hospital the temperature was normal, the leucocytes 8,600. The edge of the liver, which was tender could be distinctly felt on deep inspiration about two fingers' breadth below the costal arch. X-ray examination not only showed the enlarged liver but also c early revealed a mass of small stones in the gall-bladder.

At operation the liver was found to be enlarged so that the lower edge descended to a distance of about two fingers' breadth below the margin of the ribs. The liver was soft and the edge was rounded. The gall-bladder was thickened and was adherent to the pylorus. It was felt to contain several stones. Cholecystectomy was performed in the usual way, and a piece of liver was removed. The appendix also was removed, although it was practically normal in appearance. After removal, the gall-bladder was opened and found to contain thick greenish bile and twenty-three stones of irregular shapes. Cultures from the bile showed a pure growth of colon bacilli, but no growth was obtained from the liver. The total duration of the operation was 45 minutes. The postoperative course was uneventful, and the patient left the hospital on the fourteenth day.

Microscopically, the liver showed numerous areas of leucocytic infiltration. These were composed chiefly of round cells with occasional plasma cells and were located as usual about the finer bile-ducts. Sections of the gall-bladder showed a moderate leucocytic infiltration immediately beneath the epithelium. This infiltration consisted in large part of polymorphonuclear leucocytes.

Summary. History of gall-bladder trouble for about three years. At operation a thickened gall-bladder and stones were found with enlarged œdematous liver. Microscopically the liver showed the usual findings of areas of leucocytic infiltration. A colon bacillus was isolated from the bile, but cultures from the liver were sterile.

Case 8. Miss S., aged 31. During last six months patient had had several attacks of pain in right hypochondrium, the last two of which were very severe and associated with nausea and vomiting. There had been no radiation of the pain, no icterus and no chills. The maximum temperature observed by her physician was 100.4°. On admission to the hospital the temperature was 99.6°, the leucocytes 9,600 and the urine normal. A mass could be felt extending downward from the right costal arch to the level of the umbilicus. This mass was movable on deep inspiration, was very tender and seemed to be an enlarged gall-bladder. On percussion, liver dullness was found as high as the fourth interspace in the mamillary line.

At operation a greatly enlarged and distended gall-bladder was found. The liver was deep bluish red in color and very soft. The lower edge was rounded and was at a level almost as low as the umbilicus. The gall-bladder was removed in the usual way, and a piece of the right lobe of the liver about two inches to the right of the gall-bladder

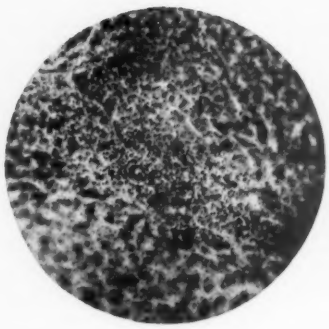

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 10. Case 5. Leucocytic infiltration involving the parenchyma as well as the interlobular tissue of the liver.

Fig. 11. Case 6. Extensive cirrhotic changes, characterized by marked hyperplasia of connective tissue around the bile channels, as shown at *a*, and definite atrophy of liver lobules. This should be compared with Fig. 16 made with the same magnification which illustrates practically the normal size of the liver lobules and the normal amount of connective tissue in bile channels of approximately same size. Markedly cirrhotic changes will be readily noted.

Fig. 12. Case 6. Higher power photograph of Fig. 11, illustrating clearly the extensive thickening of the walls of the finer bile-ducts (designated as *a*) and the relative freedom of the interlobular blood-vessels (one of which is noted at *b*) from sclerotic changes. At the peripheries of the thickened walls of the bile-ducts are collections of leucocytes (indicated by *c*). These findings are typical of the so-called "biliary cirrhosis."

site was excised. The appendix also was removed, although it showed no marked pathological changes. The total duration of the operation was 62 minutes. The gall-bladder was found to have a very thick œdematous wall, measuring about one-fourth inch in thickness. The mucosa, in the lower portion, was gangrenous in appearance, but that at the upper portion was merely hæmorrhagic. The gall-bladder contained two mulberry-like calculi, one of which was crowded into the opening of the cystic duct, producing a complete obstruction. There was no bile in the gall-bladder but instead a thin secretion, brownish-black in color, which evidently contained old, changed blood. The patient's postoperative course was normal.

Microscopically, the liver showed the typical lesions which have been so frequently described above, consisting essentially of a leucocytic infiltration of the interlobular tissue and around the smaller bile-ducts. Sections of the gall-bladder through its lower portion showed the mucosa to be very hæmorrhagic with the epithelium absent and an extensive leucocytic infiltration of the subjacent layers. In the upper part of the gall-bladder the mucosa was found to be sufficiently intact to allow it to be distinguishable, but there was evidence everywhere of marked inflammatory reaction. Sections of the gall-bladder wall which were stained with gentian violet showed numerous clumps of bacilli resembling colon bacilli in appearance.

Cultures from both the piece of liver and the contents of the gall-bladder yielded a colon bacillus. Both strains were agglutinated by the patient's serum in dilutions of 1 to 40.

Summary. Several attacks of pain in right hypochondrium during last six months. Enlarged liver, gangrenous gall-bladder, containing two calculi with only slight elevation of temperature and normal leucocytes. Colon bacillus isolated from both liver and contents of gall-bladder. Microscopically, the liver showed interlobular hepatitis.

GENERAL DISCUSSION

These eight illustrative cases are sufficient to show clearly that a definite hepatitis occurs with a fair degree of regularity in cases of cholecystitis with acute symptoms. In the chronic cases there are also almost always positive anatomical changes in the liver indicative of a chronic inflammation. The evidence for the assumption of a concomitant hepatitis with cholecystitis, of course, is most apparent in acute cases in which the liver shows gross changes consisting of enlargement with œdema and tenderness on palpation. Microscopically, as has been shown above repeatedly, the livers of these cases contain areas of leucocytic infiltration; and finally in a number of the cases, organisms have been isolated from the livers which, by agglutination tests with the patient's sera, have apparently been shown to be infecting agents. The regularity with which these

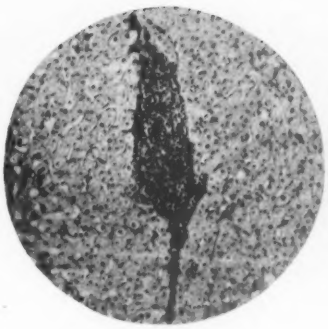

Fig. 13.

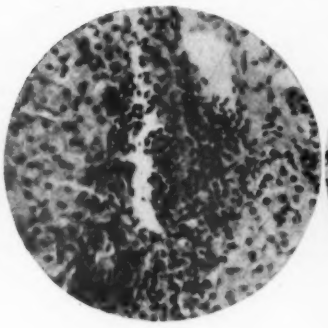

Fig. 14.

Fig. 15.

Fig. 13. Case 7. Rather extensive interlobular leucocytic infiltration.

Fig. 14. Case 7. Higher power of Figure 13 showing numerous mononuclear cells; few polymorphonuclear cells.

Fig. 15. Case 7. Section of gall-bladder. Moderate subepithelial and submucosal leucocytic infiltration consisting in a large part of polymorphonuclear leucocytes.

changes have been found even when the constitutional evidences of infection have been slight, as shown by normal or but slightly increased temperature, moderate or no increase in the number of leucocytes, etc., indicates that in all probability every case of cholecystitis, at least in the acute stage, is accompanied by a hepatitis. As a general rule, of course, the more acute the cholecystitis the more evident will be the associated hepatitis. It is interesting also that the hepatitis occurs regardless of the presence or absence of calculi and regardless of whether or not the cystic duct is obstructed. It is also noteworthy that the clinical association of icterus is an unnecessary factor, as shown by the fact that in not one of these 8 cases was jaundice observed.

The pathogenesis of cholecystitis and the question of simple, acute hepatitis. The questions naturally arise: (1) is the hepatitis primary or secondary to the cholecystitis? or (2) are the two conditions concomitant in origin? A positive answer cannot be given at this time. It is easily conceivable that the gall-bladder might be infected secondarily by the descent of bacteria through the bile passages in a case of primary hepatitis, or it is equally conceivable that the hepatitis might result from an ascending infection from a primary cholecystitis, in a manner analogous to an ascending infection of the fallopian tube in the female, or similarly to what is ordinarily supposed to be the course of events in the so-called ascending infection of the kidney. Except for those conditions of the liver which are distinctly suppurative in character and the various types of cirrhosis, apparently but little attention has been given to a consideration of hepatitis. One is forced to assume, from a perusal of the clinical literature, that simple, transient hepatitis is comparatively rare, if the condition of cloudy swelling is excluded. As a matter of fact, however, the author is convinced that a simple hepatitis is of relatively frequent occurrence. It manifests itself by malaise, slight fever (100° to 101.5°), leucocytosis of from 10,000 to 12,000 and the presence of a palpable slightly tender liver edge. The symptoms may be present for only two or three days, followed by a disappearance of the tenderness and an inability further to palpate the liver edge. Jaundice may be present. There may be none of the principal characteristics of gall-bladder inflammation present, such as the typical pain, etc. Some of these cases may be hæmatogenous in origin as indicated by the fact that occasionally one finds the described syndrome occurring during the course of or following an acute tonsillitis; others may be due to the conveyance of virulent intestinal bacteria to the liver by way of the portal vein. If it is true, as suggested, that simple, nonsuppurative hepatitis is of comparatively frequent occurrence, then it is easy to conceive that

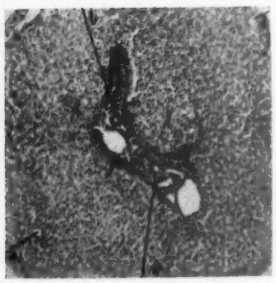

Fig. 16. Case 7. Moderate leucocytic infiltration of interlobular tissue. At *a* are designated central lobular veins. At *b* are found smaller bile-ducts of about the same size as one of those seen in Figure 11, but with walls of about normal size. This photograph taken at the same magnification as Figure 11 shows clearly the enormous increase in the thickness of the walls of the small bile-ducts in Figure 11, together with the marked atrophy of the liver lobules.

many cases of cholecystitis may be descending infections from the liver. Unfortunately the experimental work which has been done on this question is inconclusive. Doerr (6), from his own work, concluded that typhoid bacilli enter the gall-bladder from the liver. His work, however, consisted of only four experiments, using rabbits. In two of the experiments he fed large quantities of typhoid bacilli and could find none in the bile in from one to three days. In another experiment a ligation of the cystic duct was performed, the duct cut, and five days later the rabbit was injected intravenously with typhoid bacilli. When killed twenty-four hours later the rabbit had no typhoid bacilli in the gall-bladder. In another experiment the common duct was tied and the animal injected intravenously. The gall-bladder eight hours later contained typhoid bacilli. In 1909 J. Koch (7) described a thoroughly studied case of a man who died during an attack of typhoid fever. The autopsy showed a moderate cholecystitis with involvement of the mucosa and submucosa of the gall-bladder. At the apices of the papillary folds of the mucosa, just beneath the epithelium, were often found clumps or "nests" of gram-negative bacilli; apparently bacillus typhosus. The organisms were not found in sections in the lumen of the gall-bladder. From the findings in this case Koch concluded that typhoid cholecystitis is embolic and is not caused by the action of infected bile. He concluded also that typhoid carriers exist because of the harboring of bacilli in the walls of the gall-bladder with occasional liberation of some into the lumen of the gall-bladder and thence into the intestine. He also recognized the presence of infection of the walls of the large bile-ducts. Chiarolanza (8), under Koch's direction, undertook experimental work and arrived at conclusions which supported in part the contentions of Koch and were at variance with the experimental findings of Doerr, previously mentioned. After injections of typhoid bacilli both intravenously and subcutaneously in rabbits he found a lodging of the bacteria in the submucosa of the papillary folds of the gall-bladder in clumps as if embolism of the capillaries had occurred. In all of three animals in which the cystic duct was first ligated, he found bacilli in the bile of the gall-bladder. In six animals with both the cystic and common ducts ligated he found bacilli in large numbers in the gall-bladder bile. He concluded that cholecystitis is due to capillary embolism and not to infection from secreted infected bile. It is interesting also that the livers frequently showed a more or less extensive interlobular leucocytic infiltration and often a marked increase of interlobular connective tissue. The idea of the embolic origin of typhoid cholecystitis is also in accord with the work of Rosenow (9) on streptococcus cholecystitis. H. Chiari (10) considers that in typhoid the gall-bladder is infected from bile which in turn is infected by a hæmatogenous invasion of the liver by bacteria. On the other hand Girode (11) thought he succeeded in demonstrating that typhoid bacilli may gain entrance to the bile-tracts by descending from the liver; and Létienne (12), in one case, concluded that he had demonstrated the same for the tubercle bacillus. Pawlowsky (13) found that various bacteria could enter the gall-bladder from the liver after subcutaneous injection. Fuetterer (14) was able to show experimentally that bacillus prodigiosus passes through the liver in one minute from the portal vein to the general circulation. Biedl and Kraus (15) claim to have found that bacteria can pass

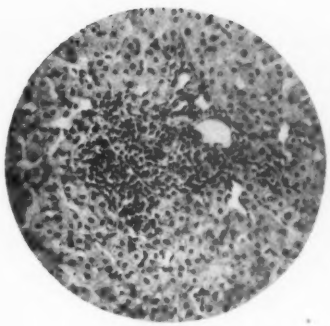

Fig. 17.

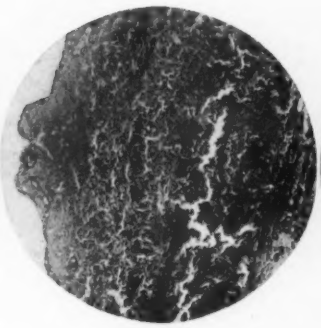

Fig. 18.

Fig. 19.

Fig. 17. Case 8. Leucocytic infiltration is seen to consist of large numbers of polymorphonuclear leucocytes and in part of mononuclear cells.

Fig. 18. Case 8. Section through gangrenous portion of gall-bladder. The epithelium is absent, and the musculature is disorganized.

Fig. 19. Case 8. Section taken at upper part of gall-bladder. The epithelium and musculature are in fairly good condition. At *a* is seen an area of leucocytic infiltration. Clumps of colon bacilli were seen in the subepithelial and submucosal tissues in specially stained sections.

through the liver into the bile as if in a process of normal secretion. At their hands intravenous injection of staphylococci was followed in from 13 to 35 minutes by their appearance in the bile.

From this more or less confusing literature it would appear that bacteria may gain entrance into the gall-bladder both by an embolic process involving the capillaries of the gall-bladder walls and by direct descent from the liver. One must not lose sight of the possibility also that bacteria may perhaps occasionally gain entrance into the gall-bladder by an ascending infection from the intestine up the common and cystic ducts. Which of these various possibilities is the most important in the production of cholecystitis remains to be determined. In a later paper it is hoped to describe additional experimental results bearing on this point. It seems fair, however, now to draw the inference that some cases of cholecystitis may be due to a descent of bacteria from the liver. Nicholls (16) writes of finding bacteria constantly in livers at autopsy; and Ford (17) has described the nearly constant presence of them in the livers of freshly killed normal animals. Colon bacilli and staphylococci were found most frequently. With apparently such a steady stream of bacteria passing through the liver and into the gall-bladder it seems reasonable to suppose that occasionally, at least, a virulent strain might easily induce a hepatitis in transit and a later inflammation of the biliary passages. Any focus which would discharge virulent bacteria into the portal system would, therefore, become a potential source of infection for the liver and gall-bladder. The well-recognized intimate association of appendicitis and cholecystitis may perhaps be explainable on this basis. In this connection it is interesting to note that Gale (18) considered that a case of cholecystitis under his observation had its origin in hæmorrhoids and that the infection was transported through the hæmorrhoidal veins to the portal vein and thence to the liver and gall-bladder. On the other hand, if a cholecystitis is well established, it is very probable that an ascending infection of the liver may be constantly recurring, possibly through the lymphatics surrounding the bile passages. In some of our cases, particularly Case 1, the type of lesion in the liver strongly suggests a pericholangitis of this type.

Relationship to pathogenesis of cirrhosis of liver. The finding of cirrhotic changes, as shown especially in those cases which come under the classification of Type 2, is of great interest, particularly from the standpoint of the etiology of cirrhosis in general. The occurrence of cirrhotic changes in the liver

Fig. 20. Case 8. Photograph of removed and opened gall-bladder showing the two stones. The wall of the gall-bladder is seen to be enormously thickened. The black portion at the fundus represents gangrenous tissue. At *A* is a beginning diverticulum in which one of the stones was lodged which obstructed the opening of the gall-bladder into the cystic duct.

secondary to disease of the bile-tracts is so well known that the distinctive name of "biliary cirrhosis" has long been used to distinguish this condition. But, at least as ordinarily employed, the term is applied to that form of cirrhosis which follows obstruction of the hepatic or common ducts. In 1882 Mangelsdorf (19) collected all the reported cases of cirrhosis of the liver. Of the total of 321 cases, 184 were associated with obstruction of the biliary passages and gave a history, neither of syphilis nor of certain or doubtful alcoholic intemperance. The assumed importance of the factor of biliary obstruction in this connection has become so deeply rooted that it has commonly been supposed that the so-called "biliary cirrhosis" is due to the stasis of bile *per se*. Case 6 clearly indicates that it is possible to have well-marked cirrhotic changes even when there is not the slightest evidence that there has ever been any stasis of bile. Quincke (20) mentions an extension of a cholangitis up into the finer branches of the hepatic duct "with proliferation of the interstitial tissues in the liver with new formation of bile passages — in other words, biliary cirrhosis." Yet later he speaks of "biliary cirrhosis" as if it were inseparably connected with bile stasis.

Theoretically, it would seem that the mere damming of bile back into the liver could scarcely induce serious changes unless occurring to such an extent that there was impairment of the circulation, because bile is normally present in the liver cells. It would seem rather that the infection which is associated with such a condition must be the more important factor; for the changes are essentially of the nature of a chronic inflammation. Especially would this be the case when the infection is chiefly around the biliary passages and hence involves the interlobular tissues, as has been found to be the prevailing characteristic of the inflammation observed in the cases described in this article. Mention should be made in this connection, however, that Harley (21) observed a moderate cirrhosis without jaundice, in cats one year after ligating the left hepatic duct. It is unfortunate that he made no bacteriological studies and therefore that the importance of infection cannot be determined in his results.

A detailed discussion of the possible bearing of these changes upon the pathogenesis of ordinary atrophic cirrhosis of the liver must be reserved for a later paper. A few of the points involved, however, may well be considered. It has been customary to consider that the chief histological characteristic of the atrophic type of cirrhosis is a perivascular inflammation and thickening involving the tissue surrounding the branches of the portal vein, as distinguished from the inflammation surrounding the fine branches of the bile-ducts in the "biliary cirrhosis." Adami (22), for example, classifies cirrhosis into portal, true biliary (Hanot), obstructive biliary, etc, Others consider that no sharp anatomical distinction can be made between the so-called portal and biliary types of cirrhosis. Quincke (23), in discussing biliary cirrhosis, states: "The proliferation of connective tissue and

the atrophy of the liver cells may attain as marked a degree as that seen in atrophic cirrhosis; so that it may lead to congestion of the portal system. No characteristic anatomic difference can be found between cirrhosis due to biliary stasis and other forms of cirrhosis. The proliferation of the bile-ducts, which Charcot's pupils consider so characteristic, is by no means specific; on the contrary, the same picture is seen not only in every form of interstitial hepatic inflammation, but in acute atrophy as well." Concerning the commonly supposed etiological relationship of alcohol to atrophic cirrhosis Adami (24) states: "while alcohol has been credited with being the etiological factor (in portal cirrhosis with contraction) in about 60 per cent of cases, experimental investigations do not bear this out." There is already an extensive literature which indicates that bacteria play an important rôle in the production of cirrhosis. Adami himself has obtained strong evidence favoring this view. Weaver (25) in 1899 produced cirrhosis of the liver in guinea pigs by subcutaneous and intraperitoneal inoculation of a colon bacillus. Hektoen (26) in 1901 also produced it in guinea-pigs, rabbits and dogs by subcutaneous injections of a pseudo-diphtheria bacillus. Adami (27), discussing the confusion concerning the relationships of bacteria, alcohol, etc., to hepatic cirrhosis, concludes that, "before bacteria can act there must be a lowering of vitality of the liver parenchyma. This can be produced by alcohol, bacterial toxins and certain organic fatty acids."

Type of operation. It may not be out of place to discuss here briefly the bearing of our findings upon the question of what kind of an operation seems most suitable for infections of the gall-bladder, i.e., whether in general the gall-bladder should be removed or simply drained. It is evident from the cases described above that any operative measure directed solely at the gall-bladder will be able, theoretically at least, to deal with only part of the infected tissue; for, as has been shown, the infection is present in the liver as well as in the gall-bladder. In other words, we should recall that there is both an intrahepatic and an extra-hepatic biliary tract and that both are involved in the inflammation. At best our present surgical methods will allow us to deal only with the extra-hepatic tract, which in total length must be much smaller than the intra-hepatic system of bile channels.

Even here, of course, the amount of tissue which can be extirpated is limited to the gall-bladder and cystic duct. At first thought, therefore, it would seem that the removal of such a relatively small part of the whole tissue involved would have a negligible effect in curing the patient. But nevertheless the evidence is strong that gall-bladders which have once become seriously infected tend to harbor bacteria actually in their walls; and these in turn apparently may give rise to frequent ascending infections of the liver, apparently through the lymph channels around the bile tracts. These considerations would suggest that perhaps the best operative procedure would be one which combined the extirpation of the maximum amount of infected tissue, which can be safely done, with the establishment of the most generous possible drainage of the rest of the infected tissue. The operation devised by Kehr (28) seems to fulfill these requirements. It consists of the removal of both the cystic duct and gall-bladder, with the institution at the same time of drainage of the hepatic duct accomplished by the insertion of a small tube, through the opening where the cystic duct previously joined the hepatic duct, upward into the hepatic duct toward the liver. But unfortunately this operation seems to be associated with an increased risk both as to the immediate mortality and as regards the subsequent possibility of scar formation causing a stenosis of the hepatic duct. On the other hand, it is open to question if artificial drainage of the hepatic duct in cases in which there neither has been, nor exists at the time, an obstruction of the common duct, is of any more value than the drainage obtained in the natural way. If there is no distinct advantage in the hepatic duct drainage, then the removal of the infected tissue contained in the cystic duct and gall-bladder should come near to fulfilling the theoretical requirements. Moreover, clinical results certainly seem to indicate that after removal of the infected tissue

contained in the gall-bladder and cystic duct, the hepatic inflammation can handle itself.

The fact that in many cases a simple drainage of the gall-bladder has resulted in a permanent relief from symptoms probably indicates only that in a certain percentage of cases the infection of the biliary tract has been sufficiently superficial to permit a fortunate restoration to normal conditions. One of the great difficulties in deciding upon the nature of the operation to undertake in a given case is the determination at operation of whether or not the gall-bladder is extensively enough involved to preclude the probability of a restoration to a normal condition if allowed to remain. The various points which might profitably be considered in arriving at such a conclusion will not be discussed in this paper except to state that probably the existence of a pericholecystitis, as evidenced by adhesions of the gall-bladder to other viscera, almost always indicates that an extensive invasion of the gall-bladder wall has occurred and that probably, therefore, there will be recurrences of trouble if the gall-bladder is allowed to remain. In several of the series of cases of which this paper is a report, cholecystostomy rather than cholecystectomy was performed, in a few because the poor general condition of the patients warranted only the safest possible procedure even at the risk of an incomplete cure, in others because of a desire to determine if after cholecystostomy the enlarged liver would diminish in size. In every case a marked diminution in the size of the liver occurred. It should be stated, however, that in general those cases which presented the most marked pathological changes in the biliary tract were treated by cholecystectomy rather than by simple drainage. The finding in Case 2 that the infecting organism could be recovered from the bile drainage as late as 10 days after the operation is interesting as indicating the length of time required for the complete elimination of the infection from the liver and bile tracts. Terrier (29) reported finding the colon bacillus in the bile from a fistula four months after operation. No proof, however, was given that the organism was actually an infecting agent. It may have been merely a non-pathogenic strain which had been carried to the liver from the intestine and eliminated in the bile.

Diagnostic value of an enlarged liver. From a diagnostic point of view the existence of a hepatitis with its attendant enlargement of the liver is apparently of great importance. In several of our cases in which the presence of gall-bladder disease has been doubtful, the occurrence of an enlarged liver has been made the determining factor in the diagnosis, and the subsequent findings at operation have justified the wisdom of placing great importance upon it in diagnosis. It need hardly be mentioned that the hepatic enlargement is important chiefly in those cases in which there is no demonstrable reason for the hypertrophy except the biliary tract infection. In one case in which the diagnosis was very doubtful between gall-bladder disease and a low freely movable kidney with slight intermittent hydronephrosis, the fact that the liver was enlarged both upward and downward was the determining factor in concluding that the trouble was related to the gall-bladder rather than to the kidney, although the low kidney had been clearly demonstrated by X-ray. At operation the gall-bladder was found to contain two large stones with evidence of marked, old pericholecystitis. Cholecystectomy gave complete relief of symptoms. The X-ray can frequently demonstrate the hepatic enlargement when ordinary physical signs leave one in doubt whether there is any hypertrophy present.

SUMMARY

In 30 cases of biliary tract disease which have come to operation a distinct enlargement of the liver has been present in 26 or in 87 per cent. In the remaining 4 cases there has been definite gross evidence of previous or existing pathological change in the liver, other than an enlargement.

During the course of the operation small pieces of liver tissue have been removed for bacteriological and microscopical study. The results of these examinations may be epitomized as follows:

1. In cases of acute or subacute cholecystitis there has been constantly found in the liver microscopical evidence of inflammation.

2. The hepatic inflammation is characterized by leucocytic infiltration of the interlobular, or periportal, sheaths; in the more severe types of inflammation the infiltration may involve also the parenchyma at the peripheries of the lobules and be associated with more or less œdema, slight necrosis, and moderate fat infiltration.

3. Cultures from both the liver tissue and from the bile in the gall-bladder have usually revealed the same organism from each of the two different sources.

4. In chronic cholecystitis the liver microscopically often presents a picture practically identical with that of an early case of cirrhosis.

5. The inflammatory reaction appears to be chiefly a pericholangitis.

6. The gross enlargement of the liver is probably usually due chiefly to œdema. The enlarged livers in this series have always diminished markedly or returned to normal size after appropriate surgical treatment.

Marked cirrhotic changes have been shown to occur in the liver even when there has never been a stasis of bile.

The importance of these findings in relation to the pathogenesis of cirrhosis of the liver in general is discussed.

From the standpoint of the diagnosis of obscure or doubtful cases of biliary tract disease the presence of an enlarged liver is of the greatest importance.

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HÆMORRHAGE SECONDARY TO NEPHROLITHOTOMY[1]

By JACOB FRANK, M.D., F.A.C.S., Chicago

SURGERY and its applied technique associated with the kidney has not reached the high degree of finesse attained in other fields of surgery relative to the human economy. I might state that this is due to many and obvious reasons, the paramount one being that the kidney is constantly functioning and is an organ of such vital importance to the well-being and proper working of the human mechanism, that any interference, whether surgical or otherwise, brings results that are disastrous.

When we interfere with the parenchyma of the kidney surgically nature does not provide for sufficient rest to permit of the proper repair, thus the solution of the problem of dealing with this organ is indeed more difficult than problems associated with most phases of human surgery.

Six years ago a male patient, aged 19, presented himself for examination for relief of distressing paroxysmal pain in the lumbar region, radiating down the thigh and referred to the bladder and penis. After careful examination I diagnosed the case as renal calculus, the history having been negative throughout, with the exception of the above pains.

Fig. 1. Roentgenogram of patient showing stones in kidney.

These symptoms extended over a period of 9 years. During all this time, strange as it may seem, there was no hæmaturia. This fact made me skeptical of renal calculi and I had visions of a mistaken diagnosis.

I had the patient examined with the cystoscope and the ureters catheterized, with negative results. This made my tentative diagnosis look even more remote. But in consequence of the classical clinical picture presented I decided on the X-ray as a final procedure. A roentgenogram was taken at the Michael Reese Hospital. The film explains itself and justifies my tenacity in adhering to my original diagnosis.

All doubt being eliminated, surgical intervention was resorted to. A lumbar incision was made, and the organ exposed for inspection. In appearance the kidney was apparently normal. On palpation a goodly sized hard mass could be felt in the extreme upper portion of the pelvis. The remaining calculi, as shown in the X-ray plate, could not be palpated. It would have been manifestly easy to have removed this large calculus through an incision in the renal pelvis, but this procedure would not have reached the remaining nine stones that were apparent in the roentgenogram. These were nested and well within the kidney substance. Thus I decided to lay the organ open as I felt that a clean surgical incision would mean less actual trauma than manipulation through the pelvis. After removing the calculi, the incised kidney was approximated with three chromic gut mattress sutures; the capsular edges were brought together with alternating deep and superficial continuous sutures, the lumbar incision closed with tube drainage at the lower pole.

The patient was given the ordinary postoperative attention, and the case progressed uneventfully for a period of one week, at which time bleeding through the several small urinary sinuses that had formed along the incision occurred. In spite of careful attention, this continued for eight days. The patient's pulse at this time was 132, and he was running some temperature. I decided that further watchful waiting would only mean a poorer risk, so surgery was again resorted to, the operation being nephrectomy. The patient after this rallied rapidly, and recovery was speedy and uneventful. At present he is robust and well, with no symptoms in remaining right organ.

The excised organ was subjected to laboratory examination, and the following reported: length 12.5 centimeters; width 6 centimeters. The capsule was adherent throughout. The surface was grayish-brown. The lower and upper poles have raised yellow patches, about 1.5 centimeters in diameter; sharply circumscribed and surrounded by a thin border of dark red tissue. Many of them coalesce

[1] Read before the Chicago Surgical Society, December, 1917. (For discussion see p. 577.)

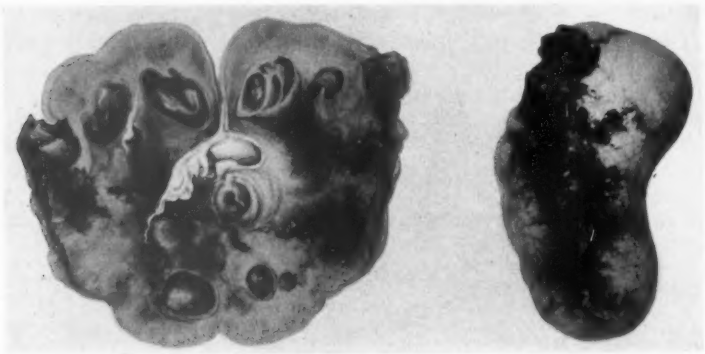

Fig. 2. Specimen removed from author's patient. See pathological report.

A section shows the cortex increased in thickness and containing a few cavities, averaging 1.5 centimeters in diameter. The walls of the cavities are reddish and tissue comprising walls can be shelled out of kidney substance easily. Also, scattered throughout cortex are small yellowish dots, slightly larger than pinhead. The pyramids are atrophied. The pelvic calyces are markedly dilated and the pelvis itself is dark red in color, showing punctate hæmorrhages. In a few words the kidney showed: (1) infarcts evidently recent; (2) chronic diffuse nephritis; (3) acute pyelitis; (4) pyonephrosis; (5) hydronephrosis.

This case presents several points of interest. In the first place, the history clearly brings back the onset of patient's trouble to the time when he was 10 years old. Nephrolithiasis in children is indeed rare, if one excludes the so-called "uric acid infarcts" of newborn infants, with the resultant passage of gravel. There can be no question as to the presence of stones in his early youth, as the patient volunteered the information that the character of the pain at onset of his trouble was identical in character with the pain he suffered just previous to his operation, the only difference being the greatly increased severity of his later pains.

The much mooted discussion, pyelotomy versus nephrotomy, as to the method of choice in the removal of kidney stones, presented itself during the first operation. A large stone was very definitely palpable through the pelvis, and none was felt through the kidney substance. Nevertheless, the roentgenograms clearly showed the presence of stones embedded in the kidney proper, and the great value of a good roentgenogram properly interpreted was manifest when, the kidney having been incised, two beds of smaller stones, one in each pole, in addition to the pelvic stone, were revealed.

The stones were embedded in the renal parenchyma proper and not in dilated calyces. The usual conception of the formation of stones in the pelvis or calyces is not supported by the findings in this case. The presence of stones in the parenchyma proper speaks for their formation here. The pelvic stone in this case may have been extruded from the parenchyma into the lumen.

To what may we attribute the hæmorrhage that followed the primary operation? The highly specialized and, therefore, extremely delicate renal parenchyma, after the manipulation and cutting incident to the operation, reacts to trauma as do all other tissues, only to a greater extent. That is to say, swelling takes place. This subsequent œdema is often taken care of by tubal drainage of the kidney substance proper. But it seems to me not good surgery to destroy further the renal parenchyma by the insertion of a tube. The desired result can be secured and the disadvantages of the above drainage obviated, according to my way of thinking, by the performance of a pyelotomy, insertion of a tube into the pelvis of kidney, and complete closure of the nephrotomy wound. The opening in the pelvis will prevent any further

increased intrarenal pressure consequent upon the blocking of the pelvo-ureteral junction by a blood clot.

By adopting this procedure the subsequent œdema of the kidney is provided for. Regulation of the intrarenal pressure in this manner will in all probability do away with secondary hæmorrhage.

In three similar cases since, I was fully rewarded with uneventful recoveries after nephrotomies by instituting pelvic drainage, as previously outlined.

This subject, it seems to me, is extremely timely as this great world war is no doubt presenting volumes of cases of kidney traumatisms and hæmorrhages. The application of the principle of pelvic drainage for kidney hæmorrhage, either surgical or traumatic, such hæmorrhages being associated with, and consequent upon, increased intrarenal tension secondary to ureteral blockage with a blood-clot, will, I am sure, result in the conservation of many kidneys heretofore doomed either to further destruction by tubal drainage of the parenchyma proper or to removal.

Conservation is the keynote of this war, and the adoption of this surgical measure will conserve our most valuable asset, lives.

THE ENTRANCE OF AIR INTO THE MEDIASTINUM DURING OPERATIONS ON THE BASE OF THE NECK[1]

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WHEN dissections are made at the base of the neck exposing the jugular vein, not infrequently suction sounds are heard with each inspiration. These sounds are caused by the entrance of air into the cellular tissue. It has always been my practice to pack this area with moist gauze, tucking it under the inner end of the clavicle. This procedure promptly puts an end to the sounds.

As far back as 1898, while assisting Dr. Fenger, after he had exposed the jugular vein throughout its course, had placed a provisional ligature around it near the clavicle, and was removing large tubercular glands from the jugular sheath, we noticed that suction sounds were heard in the lower angle of the wound. We packed the wound. Later in the operation the packing was dislodged, air again entered in large amount and very promptly there was marked disturbance of respiration, unsatisfactory efforts at coughing, and extreme cyanosis. Henceforth the patient did so badly that the operation was abandoned. As she awakened she complained of air hunger and precordial pain. The respirations were shallow and painful. Her condition was very grave and I understood that the cause of her trouble was not recognized, until Dr. Henry Favill saw her in consultation, making a diagnosis of emphysema of the mediastinum. Her convalescence was slow for several days, but she left the hospital in about the usual time.

On July 26, 1916, I operated upon Mr. A. for a large adenoma of the thyroid gland. He was a well nourished German, 42 years of age, and appeared to be in good health, aside from the goiter and mild toxic symptoms accompanying it. Ether anæsthesia was used. A transverse incision was made at the base of the neck, the skin and subcutaneous tissue dissected back above and below, and muscle splitting, rather than transverse muscle section, carried on through the muscle planes. The tumor occupied the lower pole of the left lobe and after freeing it almost completely by finger dissection, finding I needed more room, I further pulled apart the verticle fibers of the sternohyoid and sternothyroid plane almost to their lower attachments. At once suction sounds were heard with each inspiration, not so loud as I am accustomed to hearing where no symptoms ensue. Before I could secure a packing to insert, the patient appeared to be arousing from profound narcosis, stiffened his whole body, held his breath, had a paroxysm of coughing, set his jaw, and became very cyanotic. I mistook these manifestations for poor management of the anæsthetic. The operation was temporarily interrupted and for fully 10 minutes unsuccessful efforts were made to induce profound anæsthesia, hoping to overcome his coughing. This difficulty appeared to be due to his shallow and infrequent breathing. By crowding the ether his coughing almost ceased and he was sufficiently narcotized to allow the operation to be hurriedly completed. After closing the wound, Dr. J. W. Clark removed his tonsils without further serious respiratory difficulty. The patient left the operating room at four o'clock and

[1] Read before the Chicago Surgical Society, December, 1917. (For discussion see p. 577.)

was put to bed, pale and unduly moist with perspiration. His fingers were cyanotic, pulse 112, regular but very weak, respiration 24 and his condition not very serious. As he began to awaken little paroxysms of coughing followed almost every inspiration, each leaving him a little more cyanotic. He continually tossed about in bed, and when further awake complained of air hunger, great precordial fullness and precordial pain with each inspiration, greatly accentuated by deep breathing. As he grew more cyanotic venous blood exuded from his tonsillar wounds. His voice was weak, eyes sunken, expression anxious and he later sat up in bed struggling for air, a terrible picture of suffocation. At 6 o'clock his temperature was 100, pulse 126—regular, weak, respiration 26, shallow. At 6:30 pulse 140, respiration 28. At 6:45 pulse 155, very weak, respiration 34. At 7 p.m. I was called by the interne who feared he would die before I reached the hospital and on examining him I found emphysema of the subcutaneous tissue at the front and left side of the neck extending down over the upper third of the middle and left anterior surface of the chest. There were also typical deep emphysematous clicks originating in the superior and lower mediastinum. These were distinctly heard immediately around the heart with both systole and diastole. The heart was extremely tumultuous. I at once concluded that his troubles were due to emphysema of the mediastinum. Although he had ¼ grain morphine with 1/150 of atropine before going to the operating room an additional ⅛ grain morphine did not benefit him. Between 6:45 and 7:30 his pulse could not be counted and from 7:30 to 8:30 ranged from 165 to 180 when it could be gotten; respiration about 44, very shallow and irregular. Fresh air oxygen and digitalis products did not benefit him, it looked as if he would shortly die. I then removed 15 ounces of blood from his median basilic vein. His cyanosis cleared a little but not as much as I expected. On the other hand his breathing became far more comfortable and I was surprised at the degree of relief obtained. His pulse became more full at once and ranged around 150 and throughout the night he continued to improve. His improvement dated immediately from his venesection. At 6 a.m. the following morning his temperature was 100 and pulse 132—respiration 42. I then felt certain of his recovery. At 2 p.m., his temperature was 100, pulse 100, respiration 24. After this he had a little temperature for several days; pulse ranging about 100. For at least a week it was observed that his breathing was labored, his clavicle and scapula making very wide excursions with each inspiration and cyanosis was still present but gradually disappearing. It was at least one week after the operation before all the air clicks had disappeared from his mediastinum, those about the heart lingered the longest. While his convalescence was otherwise undisturbed I must call attention to the fact that he still showed sunken eyes and cheeks and considerable pallor for two or three months as a result of this severe cardiac jar; in other words he did not seem to come back.

I have also seen one patient with fractured ribs on the left side which penetrated the lung. Emphysema of the chest was noticed the day of the injury. The following morning air had reached the anterior mediastinum and from the depth of the emphysematous sounds and their relation to the cardiac area and the heart movements and the grave cardiac disturbance, I inferred the air had extended to the middle mediastinum, as it seemed to have done in the patients previously referred to.

The symptoms and course of all these patients were almost identical.

From these experiences we may be certain that when sufficient air enters the superior mediastinum during operations on the anterior surface of the base of the neck, certain definite grave symptoms similar to those of suffocation suddenly occur and the clinical course will be pretty uniform. In such operations efforts should be made to prevent this accident and when it occurs, prompt consideration given it. The surgeon must then decide whether the operation is to be continued or abandoned, and what if any treatment is to be adopted. The literature abounds in references to the possibility of emphysema of the mediastinum in accidents to and operations on the trachea and all the upper respiratory passages, but thus far search through the literature has revealed nothing descriptive of this accident and its symptoms in connection with operations at the base of the neck. I am of the opinion that it occurs much more frequently than is supposed and that the grave symptoms are credited to the anæsthetic. The accident appears to occur because we disturb structures of the neck in their mediastinal location where the cellular tissue is opened and air is aspirated. Among my observations, one occurred through following down the internal jugular into the superior mediastinum; the other through separation of the sternothyroid and sternohyoid plane to their origin which is in the superior mediastinum. From illustrations in Gray's *Anatomy* of cross and vertical sections of the chest and from my own experiences I infer that when a small amount of air enters the superior mediastinal cellular tissue, it may create no disturbance but as

larger amounts are drawn in, the air passes downward through the cellular tissue immediately behind the sternum to the anterior mediastinum and then finds easy egress backward into middle mediastinal chamber where it lies next to and may entirely surround the pericardium. In my lung wound reference I infer the air extended through the cellular tissue lying just outside of the parietal pleura to the anterior and from there to the middle mediastinum. The symptoms have been sufficiently enumerated in the case history but I must impress upon you that the precordial pain is most intense.

It seems quite apparent that the irritation of the foreign air of a lower temperature would be sufficient to induce reflex coughing through direct irritation of the right and left phrenics which lie in the space invaded by the air in the middle mediastinum and also through contact with the outside of the parietal pleural reflexion, or mediastinal pleura, which surrounds the pericardium, and the presence of air in the neighborhood of the pericardium and the pressure that it induces about the heart, would disturb its delicate nervous mechanism and its free movement and thus account for the rapid, erratic and tumultuous heart. I infer from the published advice of many to incise the mediastinum for serious symptoms induced by emphysema due to wounds of the respiratory tract, that where we have closed wounds and the air is thus retained the temporary disturbance is greater than in those cases where wounds in the mediastinum have been left open, thus giving free egress to the air. It also seems to me that the condition differs in its likely outcome from wounds of the trachea and upper respiratory passages from which there may be a continuous supply of air to the mediastinum with increasing irritation and pressure symptoms and frequently resultant death.

The sudden partial awakening from an apparently profound narcosis is probably due to severe cordial pain quite comparable to true angina. It is likely that after the first symptoms of suffocation have passed the anæsthetic may be pushed with benefit in some cases and the patient profoundly narcotized, and in most cases operations of short duration may be completed.

In the treatment of this condition I feel that free ventilation of the room and oxygen are indicated, that possibly digitalis products are beneficial. In the graver cases venesection offers us more relief than anything else. If after venesection there is still no relief, incision of the anterior mediastinum has been recommended in somewhat parallel conditions. The wisdom of this is debatable because it is possible that instead of relieving tension more air might be admitted and the symptoms aggravated. This question needs to be settled by animal experimentation. If incised the edges of the wound should be kept apart by stiff rubber drains or other methods, but at no time should gauze be used for that purpose because its meshes fill with blood and soon plug the wound. It also remains for us to determine by experimentation what, if any, relief may be obtained by very slow aspiration of the anterior mediastinum through needle puncture.

PROBLEMS IN ABDOMINAL SURGERY[1]

By THOMAS J. WATKINS, M.D., F.A.C.S., Chicago

THIS paper will consider in abstract problems commonly encountered in gynecological surgery which have been of special interest to me, and which I hope will interest you and stimulate profitable discussion.

Prevention of postoperative shock and neurasthenia. The work of Crile upon these subjects has been an important contribution to abdominal surgery, particularly as regards fear, fright, and unnecessary traumatism of tissues.

It is important to avoid scaring the patient with a serious or hopeless prognosis. Starvation and purging before operative work weakens the patient, disturbs the digestive system and impairs blood coagulation. Good sleep and the use of morphine and scopolamine before operation does much to relieve nervousness and fear. Our custom is to give bromide the night before operation, and a hypnotic, if necessary, for sleep. Forty-five minutes before operation 1/6 to ¼ grains of morphine with 1/150 grains scopolamine is administered hypodermically. This allays nervousness and fear, and commonly the patient sleeps while waiting for operation. These doses never produce the alarming symptoms which at times follow larger ones. It also materially aids the anæsthetic.

The best anæsthetics I have seen were given in Crile's clinic, and have committed me to the use of gas-oxygen anæsthesia, with ether as needed, in nearly all cases.

Our results from infiltrations with novocaine and quinine urea as advocated by Crile were disappointing. We were unable to observe any benefits from their use; they added somewhat indirectly to the dangers of infection, and were discontinued.

Local anæsthesia is valuable in some cases, teaches the operator much about the sensitiveness of the abdominal viscera and develops gentle surgery. A general anæsthetic is no license to unnecessarily traumatize tissues.

Ether by the drop method continues to be the safest general anæsthetic for the untrained, inefficient anæsthetist. Selection of the anæsthetizer is more important than selection of the anæsthetic.

Observation shows that neglect to protect the wounds from contamination from the surrounding skin is common, more common in this country than in the leading European clinics. No one would contend that the skin can be made surgically clean, but fortunately the bacteria of the skin are usually of not much pathogenic importance, not usually enough to prevent primary union, though they must occasionally produce peritoneal adhesions. To leave iodine on the skin and to rub it into the peritoneal cavity during the operation as is often done must add to peritoneal irritation and be a factor in production of adhesions.

Rubber as a substitute for the gauze roll and pads in the abdomen. The papers of Brinsmade, of Brooklyn, and Keith, of Providence, upon the use of rubber instead of gauze to prevent abdominal adhesions were of much value. Following Brinsmade's paper, which appeared first, we have been studying the subject and now use rubber as a routine, almost to the entire exclusion of gauze. We are using thicker tissue than they advised, the rubber being the thickness of heavy rubber gloves. It is used in pieces 18 inches wide by 30 inches long. The heavier rubber does not roll up in wads and the weight of the rubber aids in keeping the intestines out of the way.

The difference in the amount of traumatism to the peritoneum produced by rubber and gauze must be so self-evident, that experiment and argument are unnecessary. In the majority of cases of abdominal surgery the rubber tissue permits the operation to be done without the use of any gauze in the abdominal cavity and without added inconvenience.

Is it better to sponge out or to leave fresh blood in the abdominal cavity? This would logically apply to clean cases *only*. In the earlier days

[1] Presented before the Chicago Gynecological Society, November 16, 1917. (For discussion see p. 582.)

of abdominal surgery before asepsis became perfected to present standards, it was an established custom to "sponge dry" before closure was made.

For some years surgeons have left as much fresh blood in the abdomen as possible in cases of ruptured tubal pregnancy. This is also often done in cæsarean operations. These cases, judging from clinical evidence, have no more postoperative adhesions than do cases when the abdomen has been left free of blood. In fact I do not recall any such patient that had evidence of postoperative adhesions. Blood left in the abdominal cavity must quickly absorb. It seems logical to conclude that fresh blood left in the sterile abdomen is less apt to produce adhesions than the traumatism occasioned by removal of it by sponging. The advantage of leaving fresh blood in anæmic individuals is self-evident. This cannot safely be done without assurance of complete hæmostasis. I have not practiced this method in sufficient numbers of cases nor for sufficient length of time to estimate results except in ectopic pregnancy and cæsarean section. I have had no cases where the blood left has caused trouble.

Supravaginal hysterectomy. I desire to make some comments upon the indications and technique of supravaginal hysterectomy. Unsatisfactory results occur too frequently after abdominal section for pelvic disease, often the result of incomplete surgery. This has even impressed the laity to the extent that patients often fear that one abdominal section will necessitate more abdominal operations. This is at times due to leaving a crippled, functionless uterus. A uterus is often suspended that should be amputated at the cervix. As a general proposition, a uterus that contains sufficient pathology to indicate an abdominal operation is better treated by supravaginal hysterectomy than by suspension. There may be occasional exceptions to this rule. It is an error to suspend a uterus that is not going to participate in reproduction. This is emphatically the case if the patient has painful, profuse menstruations, and persistent leucorrhœal discharge. Supravaginal hysterectomy is preferable to suspension when the local or general condition of the patient makes future pregnancies inadvisable.

Excision of both fallopian tubes should include excision of the uterus. The one operation is done as quickly and as easily as the other. Infected tubes are nearly always associated with a diseased uterus. After the tubes are removed the body of the uterus becomes useless. To leave such a uterus frequently results in dysmenorrhœa, menorrhagia, leucorrhœa, and an added danger of exudate and adhesives. To remove the body with the tubes leaves a better covered wound and a stronger pelvic floor than results when the tubes alone are excised.

Supravaginal hysterectomy is rapidly displacing myomectomy, much to the benefit of the health of the patient. The indications for myomectomy have justly become very restricted. Experience has shown that few pregnancies occur after myomectomy, that other fibroids often develop and require subsequent removal, and that menstrual disturbances are common.

There is no evidence that menstruation is an eliminative function or of any use except in its relation to reproduction. I have been unable to observe that preservation of menstruation prolongs the functional life of the ovary.

Menstruation can be preserved by high amputation when necessary for sentimental reasons. The presence of a small part of the body of the uterus attached to the cervix is certain in my experience to preserve menstruation, free from pain and generally scant in amount.

Supravaginal hysterectomy is usually preferable to plastic operations on the tubes to produce sterility for reasons given above. The relative indications for partial and complete hysterectomy are not entered for discussion.

Aside from the subject, so that this paper may not be wrongly interpreted, it seems advisable to state that ovulation has been demonstrated beyond doubt to be an important function and should not be destroyed by operation except in malignant disease.

Treatment of the cervical wound after supravaginal hysterectomy. I have seen a number of

cases of prolapse of the cervix after supravaginal hysterectomy. Some of these patients had been operated on by me, and I have invariably sutured the ligaments to the cervix to produce as I thought a firm pelvic floor. This was done by closure of the cervix and by suture of the ligament and peritoneum to and over the cervix. This has meant essentially suture of peritoneum to peritoneum, and a union resulted which in some cases has stretched and prolapse has resulted.

I desire to present to you a modified technique which I believe will prevent prolapse. The walls of the cervix are not sutured together. The cervical wound is closed by superimposing the cut ends of the broad ligaments. This is accomplished mostly by "purse-string sutures" which invert the raw surfaces, and is accomplished as follows:

A suture is passed through the posterior wall of the cervix, through the ovarian ligament, through the infundibulo pelvic ligament, through the round ligament, and through the anterior wall of the cervix. While the suture is tightened the raw surfaces are inverted. The same is done on the other side. One or two additional sutures may be necessary to obtain complete closure and to bury raw surface. Additional sutures are used if necessary to take up any lax tissue and to further join together the broad ligaments.

This method does not constrict the circulation in the cervical tissue, which is a common technical error. Raw surfaces are approximated which insure strong union and which should prevent prolapse. The raw surfaces are quickly and efficiently inverted.

A common neglect in abdominal pelvic surgery is failure to do needed plastic vaginal repair.

FŒTAL DEATH DURING LABOR[1]

By CHARLES B. REED, M.D., F.A.C.S., Chicago

"TO see the infant pass from the fœtal slumber, into the sleep of death, out of the amniotic sac of this world into the shroud which is the amniotic sac of the next, is to the obstetrician who sets a value on infantile life, both a humiliation and a reproach."

To pass the period of gestation in suspense, discomfort and inactivity only to have the event terminate in a fatality, is to the mother a grievous affliction. Nonetheless, our statistics show that out of every hundred babies born, from four to six die during labor or within a short time thereafter in consequence of the event.

Various factors contribute to this result. Some die from maternal and some from fœtal disease of a definite character like syphilis or hæmophilia, cerebral injury or pneumonia, but excluding these as somewhat outside the purposes of this paper we may safely assert that asphyxiation is the form of death that obtains in most cases.

Asphyxia neonatorum is one of the most important and yet one of the least understood of all the phenomena connected with childbirth. It is important, not only for its frequency but for its deadliness. It is little understood because the investigation of its elements, phases, and etiologic conditions is fraught with difficulties that are many times insuperable. However, the clashing together of a few theories may clear the atmosphere and define our problem.

Asphyxiation may be described as that condition of the babe in which no sign of life exists except the heart activities. It is not a pulselessness as the derivation of the word implies, but a lack of respiratory function. It is the partial or complete arrest of the physiological readjustment at birth.

Cases of suffocation due to prolapse of the cord, coiling of the cord about the neck of the child, as well as funicular rupture in labor are not unfamiliar to us but they are so obvious in their mechanism that they need only to

[1] Read before the Chicago Gynecological Society, November 16, 1917. (For discussion see p. 581.)

be mentioned here. It is more practical and more profitable to review some of the foreseeable and sometimes preventable instances of asphyxiation that occur as accidents or incidents of delivery.

So long as the bag of waters remains intact, the danger to the babe is extremely slight except through overlong persistence of the membrane or through intra-uterine interference with the cord. This mishap is, of course, possible at any stage of the pregnancy or labor, but it is far more liable to occur before the onset of the pains.

As soon as the membranes rupture, however, the fœtus is exposed to danger. Immediately the uterus becomes smaller, the contractions harder and more frequent while the gas exchange between mother and child is doubtless greatly restricted. The longer the contraction, the shorter the pain-free interval, the greater the danger to the child.

Besides, there is a marked change in the intra-uterine pressure. The diminution that comes on directly after the rupture of the membranes is replaced through the reduction in the size of the organ by a decided increase. "If the column of mercury stood at 80 before the event," says Schultze, "it rises to 150 or more after the liquor amnii escapes."

Usually this pressure is equally distributed over body and head and in normal labors is of no particular consequence, but in certain instances where the membranes rupture prematurely, and in oblique presentations, serious results will follow. In these cases, as well as in presentations of the pelvis, face and brow, where a limb is prolapsed beside the head, or in pelvic contraction, certain parts of the uterus are put under a higher degree of pressure than other portions. This happens occasionally from contact with the irregularly disposed fœtal parts or from stimulation of the uterine musculature with localized contractions. An alteration of the blood supply ensues and oxygen starvation begins in the fœtal blood while retention of carbon dioxide increases. Under the same conditions compression of the cord or of the placenta may occur, or the spongy placental site may be contracted to a dangerous degree. The definite reduction in the volume of the uterus may also react in a manner perilous for the fœtus.

The soft parts that bound and reinforce the genital canal, normally offer a serious resistance to the passage of the unlucky child and this resistance may be greatly intensified by unusual conditions in the mother or babe. Even physiologically there exists a significant difference in this resistance between the soft parts of primiparas and multiparas.

In the first labor, a marked opposition arises from the integrity and rigidity of the muscles, connective tissue, and elastic structures of the pelvis and especially of the pelvic floor. This finds outward expression in a prolongation of the labor, in particular of the second stage and is associated with an increase of danger to the babe not only from detention but from pressure. It is generally taught and statistics seem to confirm the belief that three times as many stillbirths occur among primiparas as among multiparas.

To these dangers several contributory factors may be added. Thus the primipara may be over thirty years of age, or the child may be a male. Then too an unfavorable presentation, or a difficult position as well as a necessity for operation may increase the peril materially.

That the tissues of an old primipara are less elastic, and the labor somewhat longer is commonly recognized among obstetricians even in the absence of pathology. But, in appreciating these cases, we are more likely to estimate the danger to the mother and to minimize or to disregard the peril to the child.

Nonetheless there is a real hazard to the babe in prolonged labors. In proportion to the duration of the second stage it is found that among the deaths primiparas with a stage of one hour furnish 8 per cent, and over two hours 18.3 per cent, while for multiparas, the average is one-third less. In another series of 2550 vertex labors reported by Veit, in which the second stage lasted two hours or more, it was found that in the two hour cases, 18.32 per cent were born asphyxiated, 1.7 per cent were stillborn, and 5.5 per cent died later. Among the four hour cases 49.65 per

cent were asphyxiated, 5.59 per cent were stillborn and 6.22 per cent died during the next few days.

Statistics also show, as we would naturally expect considering the presentations in gross, that the vertex is least and the transverse is the most dangerous (39 per cent). Personally some surprise was felt on finding that a face presentation was (13 per cent) only a trifle more than half as dangerous as a breech (22.1 per cent).

This is due, as we understand it, to the fact that the head is the largest and least compressible part of the child's body. Hence as it advances, the canal is slowly dilated, the power of the uterine contractions is definitely increased and when the head is born the rest of the body follows quickly. On the other hand, when the smaller and softer breech precedes, less powerful pains are required and the progress is deliberate. The thorax and finally the head finds the passage imperfectly dilated and the pains not yet developed to full strength. Retardation of the upper half of the body takes place while the lower part is delivered. A pause ensues in the course of the labor. A moderate pause in vertex cases is of no particular consequence since the cord, ordinarily, is not compressed and the child's mouth is free. In breech cases on the contrary, the cord is compressed and the child's mouth is surrounded by liquor amnii or else buried in the soft tissues of the passage. Under these circumstances the child becomes asphyxiated in a few minutes and in from eight to ten minutes will die, for as soon as the umbilicus passes the vulva the cord is squeezed between the pelvic brim and the large head and shoulders of the child and extraction must not be delayed.

Moreover, in vertex cases it is just as important to guard against too great compression of the head as against the excessive prolongation of the labor, for while compression of the skull, in the absence of such injuries as arterial rupture and lesions of the brain, does not of itself produce death, yet it may directly contribute thereto by bringing about a paralysis of the respiratory center. In brain compression, this center becomes obtunded and so retards the mechanism that no effort at inspiration is made prematurely. Now while this quiescence in the respiratory phenomena may be advantageous sometimes in protecting the child against the aspiration of mucus or liquor amnii, it more commonly happens that a permanent paralysis takes place, and after the conclusion of the labor when the oxygen from the placenta has been shut off, a child with a good heart-beat and a good circulation cannot be made to breathe in spite of the most persistent and conscientious effort. The babe becomes asphyxiated as soon as it is compelled to depend upon atmospheric air and its own inspiratory exertions. This condition is by no means rare for in many cases of fœtal death there is no evidence, postmortem, of premature attempts at respiration nor of positive lesions in the skull such as depressed fractures or blood effusions. In fact most babies that are born in asphyxia and are afterward resuscitated are examples of skull compression.

According to the degree of fœtal prostration these cases are usually divided into blue asphyxias and pallid asphyxias. Blue babies represent a minor grade of the condition and are therefore the most hopeful to work over. In fact we are not altogether sure that blue babies are markedly abnormal, for the hypercarbonization of the blood, or more accurately, as Carlson contends, the retention of acid products which produces this blueness is a necessary preliminary to respiratory activity. The normal stimulus to the respiratory center must be sought in the tidal fluctuation in the alkalinity of its blood supply which, in turn, is due to carbon dioxide and lactic acid formation. The child does not breathe because it needs oxygen, but the accumulation of carbon dioxide results in a relative acidosis of the blood which irritates the breathing center. It reacts and oxygen is taken in.

In pallid asphyxia, however, the reflexes are lost, the muscle tonus is gone, the cord is collapsed and almost pulseless while the heart beat is feeble and irregular. In fact the child has passed from vagus irritation over to vagus paralysis from which it is only occasionally rescued.

Boys suffer from asphyxiation more frequently than girls, either because as a rule

they are larger and therefore have longer and more difficult labors or because more boys are born than girls or possibly from both of these conditions. In this connection it is pertinent to note that Simpson found the second stage to average 15 minutes longer for boys than for girls.

Contracted pelvis is another cause of fœtal asphyxiation for in this complication we not infrequently have the association of a premature rupture of the membranes, stormy pains, prolonged labor, changes in intrauterine pressure and cerebral compression.

It must not be forgotten that a certain slowness in the expulsion of the child is usually propitious. The pain-free interval is then sufficient for the continuance of placental respiration and the gradual conquest of the pelvic opposition takes place by a non-injurious adaptation. Brain pressure symptoms appear only when the nourishment of the cerebral tissue is interfered with through anæmia or hypervenosity. So long, therefore, as the placental circulation is maintained and in no way diminished or cut off by tetanic contractions, medically induced or otherwise, danger can only arise through paralysis of the breathing centers when the head is exposed to hard or prolonged compression. Moreover, if the child is feeble or already on the verge of extinction through a moderate or a protracted compression, it is easy to see how the application of forceps could bring the disaster to completion. Pure cerebral compression occurs only when, in operative deliveries, the child is drawn by feet or forceps through rigid soft parts or a small pelvis. The cases of asphyxia after hard forceps deliveries are thus explained. The slowing of the heart tones from cerebral compression during the forceps operation can be readily demonstrated if the stethoscope is applied while traction is made.

Ahlfeld brings forward the logical theory that delivery of the child into the vagina with a consequent recession of the uterus over the breech may produce so great a contraction at the point of placental attachment that the babe may be asphyxiated in a short time if the end of the labor is not hastened.

To summarize then we may say that large babies, rigid inelastic soft parts, premature rupture of the membranes, artificial extraction by feet on forceps, version, moderate pelvic contraction, prolongation of the labor or any other condition which can bring about cerebral compression may be regarded as a determining factor in asphyxiation of the babe. Maternal coma, lung œdema, spasm of the respiratory muscles, premature separation of the normally implanted placenta (only one in 15 lives), and placenta prævia (50 per cent die), all result in fœtal suffocation by an obvious process. Even the hæmorrhages from a lacerated cord or traumatized arteries are really forms of asphyxiation by a legitimate extension of the term.

We now come to a question that has long been in the background of our minds. What asphyxiating effect, if any, is produced on the babe *in utero* by an anæsthetic?

Since 1902, this subject has remained more or less uneasily under the dictum of Ballentyne who stated: "While there is evidence to show that chloroform may pass over and enter the blood of the fœtus after prolonged administration to the mother, there is no strong evidence that when there it produces any serious effects. As with chloroform, so with ether. Its transmission through the placenta, if not entirely proved is probable, but there is no reason to apprehend a toxic effect unless the anæsthesia be very deep or greatly prolonged." Preyer has shown in his experiments with curare, hydrocyanic acid, and nicotine that in asphyxia of the mother animal, the blood of the umbilical vein of the fœtus becomes markedly dark in appearance, indicating that oxygen is being drawn from the fœtus to the maternal organism. It is clear, therefore, that if anæsthetics are administered for a long time the fœtus may be seriously endangered and if administered up to the point of saturation the fœtus may be killed. It is quite plausible also that injurious effects will appear earlier or follow a smaller amount of anæsthetic if the patient is organically diseased or toxic.

Davis, of Chicago, has recently become interested in this subject through his enthusiasm for gas analgesia in labor. His experiments on pregnant guinea pigs have

brought him, as we interpret his careful work, if not to the same at least to nearly the same conclusions as Ballentyne. Davis finds that gas and chloroform are more dangerous to the fœtus than ether but that all anæsthetics have their dangers when the administration is continuous or long maintained. In his opinion the intermittent use of gas, say four or five whiffs at the beginning of each pain and properly mixed with oxygen, can be carried on for a considerable time without injury to the child.

His argument, it seems to us, applies equally to ether and chloroform. These also may be given for a considerable time with safety if given in the way he prescribes for gas. In all cases the vapor has been largely eliminated by the end of the contraction and the normal metabolism is not disturbed during the interval. There is a pervasive elimination of the absorbed gases, most rapid necessarily in the case of nitrous oxide, in which the emunctories of the body must be aided appreciably by the support and energy imparted to the circulation by the powerful pump-like action of the functionating uterus.

The subject of anæsthetics would not be complete without some reference to "twilight sleep" where the accusation of injury to the babe is so commonly heard. Morphine-scopolamine analgesia definitely controls the pain of the first stage and carries the patient well into and frequently through the second. Unquestionably a small proportion of the babes must be in condition to take up the infinitesimal part of the elaborated toxin which might pass over in the maternal blood. But as we have seen in the case of other pain-relieving agents, so in this, the blood of both patients is competent to purge itself though not so freely nor so quickly as from the anæsthetic vapors. Blue babies occur just as often under "twilight" as without it, but no more so.

Masses of statistics are not yet available but observations seem to show that no disastrous effects follow the morphine-scopolamine method, unless the treatment is begun too late or the dosage is too large or too long maintained.

Excluding multiparas with worn out uterine muscles, we find that old primiparas and women with small genital canals, women with rigid inelastic soft parts and women with highly sensitized nervous systems are the ones who have protracted labors. They will not, or they cannot, use the abdominal muscles to hasten the process. In these women we find all the conditions present for an asphyxiation of the child from prolonged cerebral compression either moderate or severe. Furthermore, it is just these women who cry loudest for anæsthesia and forceps. They very properly get both, but when the child is born and fails to breathe, suspicion is bound to fall upon the anæsthetic or upon the instruments no matter how skillfully or how judiciously they may have been used.

We are left, therefore, in the belief that any anæsthetic which is continuously administered for a long time may be injurious of even fatal to the child in the manner shown by Preyer in his experiments with curare and nicotine. On the other hand we are inclined to believe that any anæsthetic may be safely used if it is given under proper indications, for a relatively short time and intermittently.

A word is necessary regarding pituitrin. It is difficult to overestimate the value of this substance in modern obstetric work and yet fœtal death may swiftly follow its ill-advised exhibition. In the roomy unobstructed pelvis of a multipara who has weak, shallow and inefficient contractions in the second stage, pituitrin is a gift from heaven. But where the babe is already advancing laboriously and is somewhat stunned by the hardships of the way, where the os is incompletely dilated or some obstacle to progress exists, the attempt to hasten delivery by the use of pituitrin may bring on tetanic contractions of the uterus and eliminate the pain-free interval for a period long enough, in some cases, to close the placental circulation and asphyxiate the babe. So powerful an agent must be used with extreme caution. Its slowing effect upon the fœtal heart tones is easily observed.

On the postmortem changes we need to dwell but a moment. They are quite as variable as in adults. There are some phenomena however that are fairly constant. The subpleural and subpericardial ecchymoses

are nearly always present. They follow, as we believe, the strong inspiratory efforts of the suffocating fœtus when the placental circulation is interfered with. There is a sudden and marked enlargement of the thoracic spaces, in which the blood drives furiously, and in which in many instances necessarily, it bursts through the tender capillary walls.

Liquor amnii, vernix caseosa or meconium may at times be aspirated into the trachea, for premature attempts at respiration will inevitably follow the hypercarbonization of the blood.

The diagnosis of fœtal death previous to birth is not always easy to determine unless the patient has been under observation before the labor began. The discharge of offensive liquor amnii after the rupture of the membranes is not always significant. The presence of meconium in the discharge may, or may not, be important, although in some cases the occurrence is justly interpreted as due to a relaxation of the sphincter which arises from an irritation of the submucous ganglia of the intestines through a hypervenosity of the blood.

The most definite and reliable information as to the condition of the child is obtained from the fœtal heart-tones wherein the signs of cerebral compression and the effects of hypercarbonization of the blood on the vagus are duly registered. Throughout the second stage the heart tones must be counted at frequent intervals and care should be taken to observe them before, during, and after a pain to be sure that the normal rhythm is resumed. The neglect of this precaution may result in the birth of a dead babe that in some instances might have been saved.

Signs of danger are recognized when the heart-beat is greatly diminished or markedly increased; also when an increase in frequency is followed by a retardation. The injection of pituitrin is regularly succeeded by a reduction in the heart-beat, but unless the dosage is too great and the uterus remains contracted too long or, unless the child is already weakening under the adversities of the labor, the heart soon resumes its normal rhythym and strength.

We may say then that the danger signs are really only three: the slowing of the heart beat, its increased rapidity, and its irregularity.

Slowing is the most common phenomenon and in the absence of pituitrin is almost pathognomonic of carbon dioxide intoxication (or acidosis), with irritation of the vagus. It is pathologic, however, only when it persists during the pain-free interval. Normally it should regain its regularity, volume, and rhythym as soon as the contraction passes away. If it sinks below a hundred (100) in this interval, danger impends and the labor must be terminated.

The next stage of intoxication is shown by a further involvement of the insulted vagus which speeds up the heart to 160 or more beats per minute. The child is now seriously imperiled and delivery is imperative.

The third degree of intoxication is signalized by the irregularity of the heart-beat which means paralysis of the vagus. There is, of course, a maximum and a minimum variation normally occurring during the contraction and in the pain-free interval but when this variation exceeds 50 beats, interference must be attempted in behalf of the child. The cessation of heart tones previously heard clearly, is manifestly diagnostic of fœtal death.

It is not germane to this paper to discuss the generally familiar methods of resuscitating an asphyxiated infant. Fœtal death is confessedly a failure and a disappointment. The treatment should aim at prevention and we shall, therefore, lay stress upon the precautionary measures which constitute our scientific prolepsis. At the risk of tediousness we must again emphasize the reliability of the fœtal heart beat as a danger signal; it behooves us to keep it under close observation.

The objection to the frequent auscultation of the heart tones is very properly based on the disturbance of the clean linen with a consequent contamination of the sterile field but this risk can be minimized by the use of a sterile receiver on the stethoscope and then by having another person either use the instrument himself or else slip the ear tips into the ears of the operator. At all events if the patient is an old primipara, or if for any reason the second stage is unduly prolonged, the heart tones must be carefully controlled.

If pituitrin is given the dose must be small, not to exceed 10 minims, and the effect should be followed with the stethoscope.

If an anæsthetic is required and ether or chloroform is chosen, let it be given *a la reine* and as little as possible. No anæsthetic should be given for more than three consecutive hours without stringent indications. If gas is used we believe with Ferguson that rebreathing should not be permitted for it is dangerous to the child. If the woman is toxic or has a high blood pressure neither gas nor chloroform is admissible. If morphine-scopolamine is employed, the woman must be at least three hours away from the end of her labor.

When the condition of the heart tones indicates danger, the fate of the child will depend upon the possibility of an immediate natural or artificial delivery which may or may not save the child. If the delivery is artificial, whether forceps or version, it is occasionally necessary to complete the dilatation of the soft parts with the hand before beginning the extraction. The operation is justified by the imminence of the peril.

If the subaeration of the blood is partial or only temporary, the child may be resuscitated but if the heart does not beat, the respiration can scarcely be established even though the head be released from pressure.

In conclusion, furthermore, we must add that while the babe may be stimulated to breathe by one or all of the usual methods of resuscitation, the prognosis is not yet altogether favorable since our statistics show that from 10 per cent to 15 per cent of babes born in asphyxia die during the next eight days. The fatality generally results from a continuing atelectasis, from convulsions, paralysis, pneumonia or some form of physical incompetence which prevents the natural and welcome readjustment after birth. Nevertheless the frequent appreciation of the fœtal heart tones is the surest criterion of fœtal safety.

INTERSTITIAL PREGNANCY. ADENOMYOMA OF THE RECTO-VAGINAL SEPTUM[1]

By ARTHUR H. CURTIS, M.D., F.A.C.S., Chicago

INTERSTITIAL PREGNANCY

In 1915, in the *Revue de gynécologie*, Waegeli presented an exhaustive summary of the literature on interstitial pregnancy. All told, including brief reports from society proceedings, he found mention of 150 cases. Of these, only 53 could pass muster as authentic instances of this type of gestation.

Three features characterize interstitial pregnancy — the fundus is more vertical, the round ligament is inserted lateral to the sack, and the tubes are asymmetrically inserted on the fundus of the uterus.

Rupture tends to occur later than in other pregnancies. An authentic case of rupture into the uterine cavity has not been reported.

The specimen of which I show you photographs is from a young woman of 27. The patient came to me because of incontinence of urine. She has one child aged 2. In a subsequent pregnancy a fœtus was lost spontaneously in the ninth week. The history was otherwise normal except that her menstrual

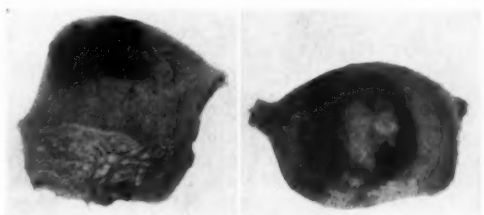


Fig. A (at left). Fundus of uterus containing interstitial pregnancy, viewed from behind. Specimen consists of right half of fundus with uterine end of right tube. This portion of the uterus was elevated nearly an inch above remainder of fundus from which it was excised.

Fig. B. Interstitial pregnancy, viewed from above. The fluctuating, thin-walled, hæmorrhagic uterus over the sack shows that rupture was imminent.

Presented before Chicago Gynecological Society, November 16, 1917. (For discussion see p. 579.)

Fig. 1.

Fig. 1. Cervix of uterus together with adenomyoma of the rectovaginal septum. A supravaginal hysterectomy had been performed three years previously.

Fig. 2.

Fig. 2. Cervix and adenomyoma bisected. No distinct line of demarcation is evident between cervix and tumor.

Fig. 3.

Fig. 3. Photomicrograph of tissue near place of transition from cervix to tumor.

Fig. 4.

Fig. 4. The adenomyomatous character of the tumor is evident in all the sections. This is a typical example.

Fig. 5.

Fig. 5. Adenomyoma projecting into the cul-de-sac, seen under low magnification (11 diameters).

period was thought to be overdue. Menstruation had previously always been regular.

Examination revealed a cystocele and a soft mass in the right uterine horn. On the history chart, it is noted that the right ovary seemed large, "possibly due to a corpus luteum." In view of the suspicion of pregnancy it was advised that operation for incontinence be deferred.

At examination two weeks later the mass was found to be larger, boggy in character, and evidently located in the right tube; immediate operation was advocated.

At operation, in the presence of Dr. Paddock of this society, an interstitial pregnancy was found. The fundus was markedly vertical, the round ligament lateral to the sack, and the right tube inserted nearly an inch higher than the left. The portion removed comprises the right half of the fundus of the uterus together with the uterine and of the right tube. As the photograph shows, the sack was about to rupture through the posterior wall of the fundus.

Dr. Leila Jackson hardened the entire specimen, that it might be studied in serial sections. Unfortunately, this task proved so difficult that presentable sections could not be obtained. The diagnosis of pregnancy was confirmed but extensive microscopic study was impossible.

ADENOMYOMA OF THE RECTOVAGINAL SEPTUM

Until the recent excellent work of Cullen, this affection remained but little known. Cases should be reported not so much because of their rarity in the literature, as because they are *not* rare in practice but have remained unrecognized.

The tumor springs most commonly from the region of the cervix and grows posteriorly, invading the cul-de-sac and tissues adjacent. Invasion occurs much as in carcinoma but less malignantly.

I have had two cases. One has not been operated upon, and is still under observation. Photographs of the specimen from the other patient are presented.

When first seen, in January, 1914, the patient was an Oak Park school teacher, 47 years of age. There was a history of menorrhagia for many years, bearing down distress, and constipation.

Upon examination were found a congenital ring in the vagina, and a large uterus fixed in retroversion. In addition a long, polyp-like, bean-sized nodule projected downward, evidently from the cervix, into the cellular tissues of the posterior cul-de-sac.

The offer of a wealthy aunt to defray all expenses persuaded the patient to go East for operation. A month later she returned in most excellent condition, minus the bleeding fundus but still possessed of the cervix and the small nodule. This mass, examined every few months, remained unaltered until one year ago. Then began a slow growth, with gradually increasing rectal distress during the next 6 months. Now development became more rapid and in two months' time the tumor doubled in size, invaded the vaginal septum, and burst through the vaginal wall into the posterior fornix. There was associated vaginal bleeding.

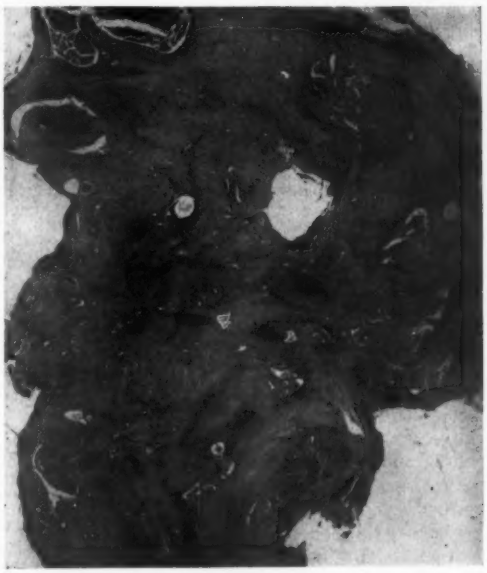


Fig. 6. Adenomyoma invading the vagina, under still lower magnification (7 diameters).

The cervix, together with the tumor mass and invaded tissues, was removed by the vaginal route. The growth was adherent to the rectal wall but did not invade it. Recovery was prompt and complete.

Study of the preserved specimen and of the enlarged photographs of the fresh specimen taken immediately after removal, shows no discernible line of demarcation between the cervix and the tumor mass.

In the photomicrographs from four various portions of the tumor the typical adenomyomatous character of the growth is at once evident.

DEPARTMENT OF TECHNIQUE

INTERILIO–ABDOMINAL AMPUTATION; A DESCRIPTION OF A NEW METHOD

With a Report of Three Cases

By W. WAYNE BABCOCK, M.D., F.A.C.S., Philadelphia
Professor of Surgery, Medical Department of the Temple University; Surgeon, Samaritan, Garretson, and American Stomach Hospitals

No more unsatisfactory results follow amputation than those from amputation through or above the hip-joint for malignant disease. After amputation for periosteal sarcoma of the femur, recurrences during the first year have been almost invariable. The removal of the leg and thigh for malignant epithelial growths has likewise been followed, in most cases, by early return of the tumor. If one adds the large secondary mortality to the primary mortality, he may well question the advisability of these high amputations for malignant disease. If, however, one contrasts the technique used in extirpating malignancy of the leg with that successfully employed against malignant tumors of the breast or certain other organs, he must be impressed by the fact that in the amputation, the first principles laid down as essential in the eradication of carcinoma are not complied with. If the old simple amputations of the breast for carcinoma were usually futile because they were not sufficiently radical, may not the present hip-joint amputations for malignant disease fail because they are not sufficiently radical? Consider the conventional methods of hip-joint amputation as that of Wyeth, Furneaux Jordan (Fig. 1), Kocher (Fig. 2), by the anterior racquet incision (Fig. 3), and even those by the interilio-abdominal method as that of Keen (Fig. 4), and it is evident that none is radical or complete as regards our present concept of infiltration in malignant disease or its dissemination and permeation along the lymphatics and fascial planes. Moreover, none of these amputations is a complete removal of the leg and thigh. All leave large flaps of skin from the upper thigh and in none is the superficial lymphatic area of the groin and the deep pelvic lymphatics

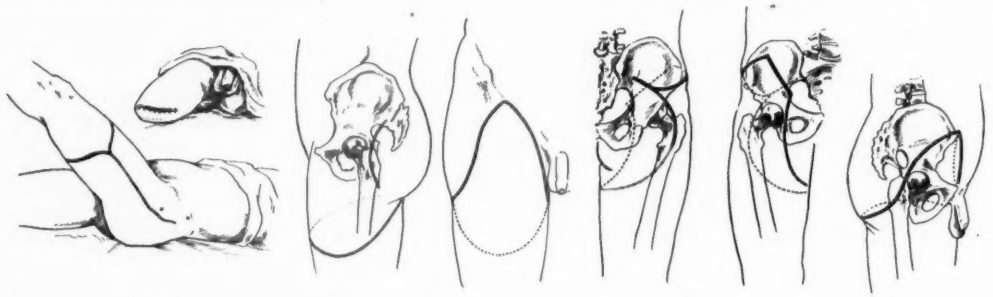


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5.

Fig. 1. Furneaux Jordan's amputation, showing the large amount of tissue of the thigh retained.

Fig. 2. Kocher's operation with preliminary dislocation of the head of the femur through a resection incision. Circular skin incision below. The lymphoid tissue of the groin is not accessible and a large part of the upper thigh is retained.

Fig. 3. Anterior racquet incision of Larrey. The flaps are formed entirely from the thigh.

Fig. 4. Keen's incision for the interilio-abdominal amputation. The flap is formed chiefly from the upper inner third of the thigh, so that much of the soft tissues of the thigh is retained.

Fig. 5. Author's incision for interilio-abdominal amputation. None of the thigh tissue is retained, and all of the inguinal lymphatics together with a part of the lower abdominal wall are removed *en masse*.

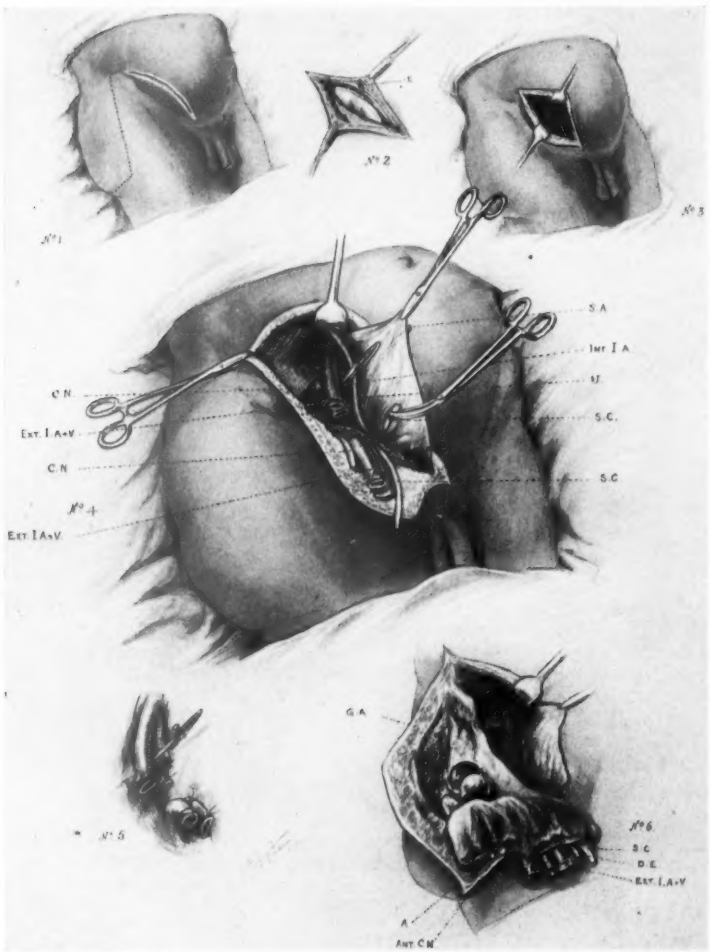


Fig. 6. No. 1. First incision. Plan of flap and second incision indicated by dotted line.

Fig. 7. No. 2. Primary incision deepened well above inguinal lymph nodes, the superficial vessels and deep epigastric artery *E*, being secured and divided.

Fig. 8. No. 3. The peritoneum is exposed; the femoral nerve infiltrated and divided.

Fig. 9. No. 4. The peritoneum is freed and retracted well up and in, exposing the side of the pelvis and the iliac bifurcation. Just below the bifurcation, the external iliac vessels are doubly ligated and divided, and a provisional clamp placed on the internal iliac artery thus controlling the circulation. The iliopsoas is divided high, and the lower portion with adjacent areolar and lymphoid tissue stripped down *en masse* cleaning the iliac fossa and the lateral aspect of the pelvis to the bone. *C. N.*, Anterior crural (femoral) nerve; *S. A.*, spermatic vessels; *Ext. I. A. and V.*, external iliac artery and vein; *U*, ureter; *S. C.*, spermatic cord.

Fig. 10. No. 5. Detail showing the clamp on internal iliac artery and the divided external iliac vessels.

Fig. 11. No. 6. The skin flap is partially formed by a second incision, and keeping close to the bone the soft tissues including all of Poupart's ligament removed *en masse*. The acetabular cavity is opened and the head of the femur disarticulated. *G. A.*, Gluteal artery; *Ant. C. N.*, anterior crural (femoral) nerve; *Ext. I. A. and V.*, external iliac artery and vein; *D. E.*, deep epigastric artery, *S. C.*, spermatic cord.

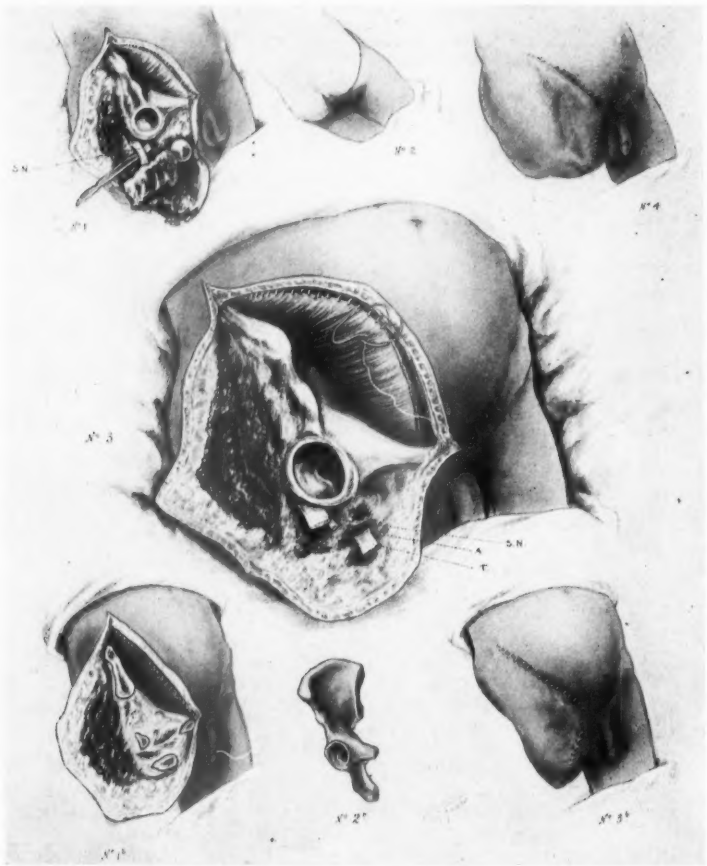


Fig. 12. No. 1. The skin flap is completed and the deep tissues of the buttock divided after exposing and infiltrating the sciatic nerve which soon comes into view after the disarticulation. *S. N.*, Sciatic nerve.

Fig. 13. No. 2. Showing line of posterior skin incision; this is made somewhat higher when the innominate bone is resected or removed.

Fig. 14. No. 3. Amputation completed. The stump of the iliopsoas is sutured to the edge of the internal oblique and transversalis, forming a new and higher abdominal floor. *S. N.*, Sciatic nerve; *A*, sciatic artery; *T*, tendon of hamstrings.

Fig. 15. No. 4. Musculocutaneous flap sutured, showing the relatively short incision. The edge of the gluteal muscles is sutured to the edge of the external oblique, reinforcing the abdominal wall. Drainage is secured by a small tube from the pelvis through a stab wound in the dependent portion of the flap.

Fig. 16. No. 1, b. Partial innominate resection. This is readily carried out with an ordinary amputation saw.

Fig. 17. No. 2, b. Portion of bone removed.

Fig. 18. No. 3, b. Completed stump after innominate resection. Disarticulation of the innominate gives a similar stump.

below the bifurcation of the aorta removed. Surely for carcinoma and probably for sarcoma of the lower extremity, the routine use of more radical and complete operations should be tried.

As for the systematic radical amputation herewith described our experience is limited to three very advanced cases of malignancy of the leg complicated by pelvic metastasis. All even-

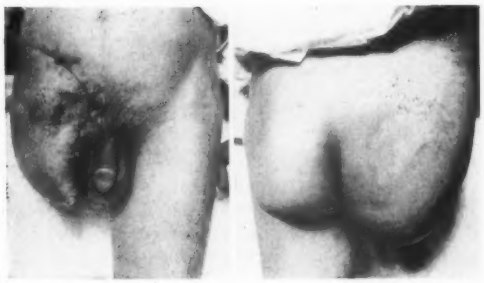


Fig. 19. Case 1, interilio-abdominal amputation, bone not removed. Anterior view of stump.
Fig. 20. Case 1, posterior view of stump.

tually succumbed, yet there was much to suggest that the operation might have availed, had it been employed earlier in the course of the disease. In each case as considerable tissue was removed above the level of the ilium we shall employ the term interilio-abdominal amputation, although in one case none of the innominate bone was removed (Fig. 5). In the second case about one-half, and in the third case all of the innominate bone was taken away. In other respects the technique was similar in each case. In each, spinal anæsthesia reinforced by narco-local anæsthesia or nerve-blocking in the wound was employed. The method, however, lends itself especially well to local or narco-local anæsthesia alone. The amputation is of the enucleation type and embraces the following features:

1. The practically absolute provisional hæmostasis without additional incision or special apparatus.

2. The facility with which the amputation may be carried out under local anæsthesia with a minimum of shock.

3. The removal of all the skin and deep tissues of the thigh, the flaps being formed above the level of Poupart's ligament and the gluteal fold.

4. The removal *en masse* of the amputated part, the lower abdominal wall, the inguinal and deeper pelvic lymphatics with the adjacent fascial planes and soft tissues.

5. The restoration of a strong abdominal floor and anterior abdominal wall.

6. The use of a single relatively small posterior or postero-external flap with ample blood supply.

7. If necessary, the removal of part or all of the innominate bone.

TECHNIQUE

The first incision (Fig. 6) starts about four centimeters above the spine of the pubis, is curved upward to a point almost eight centimeters above the middle of Poupart's ligament, and ends about four centimeters above the anterior superior spine of the ilium. If there is inguinal gland enlargement, or infiltration of the skin of the inguinal region, the first incision is so modified, as to be well above the infiltrated area. Lifting the upper skin edge the fat is undercut so as to insure its removal to a level several centimeters above the skin incision. The incision is here deepened to the aponeurosis of the external oblique, and fat and fascia stripped down to a point about six centimeters above Poupart's ligament where the incision is deepened to the peritoneum, the superficial and deep epigastric and the superficial circumflex iliac arteries being exposed, tied, and divided (Fig. 7). The peritoneum is now stripped from the hollow of the ilium to a line well over the brim of the pelvis and a point as near the bifurcation of the aorta as possible. If infiltrated, the peritoneum is resected, and the opening at once closed. Usually the peritoneum is not opened (Fig. 8). In women the round ligaments should be ligated and divided at a high level. In men, a high ligation of the spermatic vessels and division of cord, with castration by pulling the testicle through the incision, facilitates the performance of a more thorough operation.

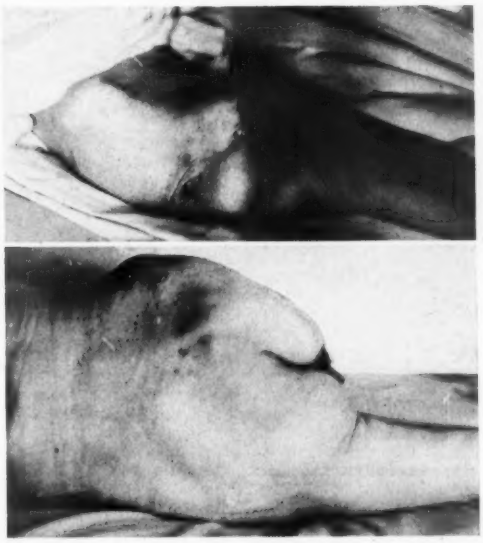


Fig. 21. Case 2. Interilio-abdominal amputation, resection of pelvis, appearance of stump.
Fig. 22. Case 2. Posterior view.

If local anæsthesia is used, the infiltration is

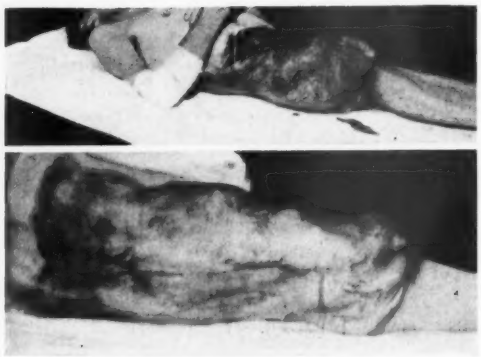


Fig. 23. Case 3. Interilio - abdominal - amputation, with removal of right innominate, showing the relatively small triangular flap.

Fig. 24. Case 3. Interilio-abdominal amputation with removal of right innominate. Posterior view.

carried out very much as in herniorrhaphy, by a 1 per cent solution of novocaine for the skin, and ½ or ¼ per cent solution for the deeper tissues.

The femoral nerve on exposure is blocked as high as possible by a 2 per cent solution of novocaine, and divided. Beginning as near the bifurcation of the aortic as possible, the areolar and lymphoid tissue is stripped down from the vessels and side of the pelvis.

The external iliac artery is now doubly ligated and divided just below the bifurcation of the common iliac, and a provisional non-traumatizing clamp placed on the internal iliac artery (Fig. 9). After elevating the leg for a moment the external iliac vein is ligated and then divided, (Fig. 10). Apart from a few small collateral branches in the pubic and gluteal regions, the operation should be practically bloodless. From the outer end of the first incision, a second incision is carried down to the greater trochanter (Fig. 6). The iliopsoas muscle is now divided fairly high, its sheath freely removed and stripped down, hugging the bone until the attachments of Poupart's ligament are divided and the acetabulum entered (Fig. 11). As the leg is permitted to hang over the edge of the table, disarticulation is readily produced and the incision continued, soon exposing the great sciatic nerve (Fig. 12) which is thoroughly blocked with a 2 per cent novocaine solution and divided as high as can conveniently be done.

From the end of the second incision, the skin is divided along or above and parallel with the gluteal fold (Fig. 13) being curved forward when it reaches a point outside the perineum to join the pubic end of the first incision. The gluteal and other muscles are now divided parallel with and about 1 centimeter above the posterior incision completing the amputation.

According to the degree of involvement (a) none of the innominate bone is removed, or (b) the bone is resected, or (c) disarticulated. Resection is very easily carried out by retracting the wound edges and sawing off the lower part of the innominate bone with an ordinary amputating saw (Fig. 16). If disarticulation is to be done the flaps should be dissected far enough back to expose the sacro-iliac synchondrosis. The symphysis is divided by a knife or the pubis by a saw, the bone rotated outward, and the sacro-iliac ligaments divided from within outward. This is not difficult.

The divided gluteal, sciatic, and pubic vessels are now tied. The stump of the divided iliopsoas muscle is mobilized, brought forward and as far as possible united with the edge of the internal oblique and transversalis (Fig. 14). A tube of soft rubber is carried from a stab through the buttock flap into the pelvis, and the divided edge of the gluteal muscles and thin covering aponeurosis sutured to the edge of the external oblique, reinforcing the abdominal wall. The skin flap is now brought forward and inward and accurately sutured (Fig. 15). Finally a supporting voluminous dressing is applied. The drainage tube is removed in twelve or twenty-four hours.

Case 1. Marjolin's ulcer with neglected secondary metastases involving contents of pelvis. Interilio-abdominal amputation with resection of peritoneum, but without removal of innominate. Operative recovery. Death from secondary metastases.

William R., age 28, had his right foot and leg deeply burned when ten years old, and ten years elapsed before the foot healed. Four years ago, after a second burn, a painful re-ulceration occurred, which persisted despite various forms of treatment and repeated skin grafting Three months ago enlarged lymph-nodes removed from the right popliteal space were found to be epitheliomatous. Amputation was refused, and two operations on the enlarging inguinal glands were performed in another hospital.

Three months later the patient cachectic and with advanced pelvic involvement returned to the Samaritan Hospital. On March 23, 1914, under narcotic and spinal anæsthesia, an interilio-abdominal amputation of the first type was performed as described. An infiltrated area of peritoneum was resected and the opening closed. The catheter drain was removed in forty-eight hours. The patient rapidly improved, gained weight (Figs. 19 and 20) the cachexia cleared, and he was able to demonstrate and sell motorcycles. Death occurred from pulmonary and local metastases about four months after operation.

Case 2. Advanced sarcoma of upper right femur, marked cachexia. Interilio-abdominal amputation with resection

of pelvis. Operative recovery. Death from metastases ten weeks later.

Mary H., age 56, was admitted to the Samaritan Hospital, November 28, 1915, for advanced sarcoma of the upper third of the right femur which had first been noticed as a small lump near the right groin three months before. The tumor had grown rapidly and involved the back of the thigh and gluteal region. The leg and foot were œdematous and the patient very cachectic and emaciated. There was some fullness above Poupart's ligament. The condition caused great pain.

Operation November 29, 1915, spinal anæsthesia. Interilio-abdominal amputation as described with resection of right innominate bone as shown in Fig. 16. The removed lymph-nodes along iliacs, ureter, and bladder, were enlarged and œdematous. The duration of the operation was 75 minutes. Despite her marked asthenia the patient passed through the operation well, but remained very cachectic (Figs. 21 and 22) and about six weeks after the amputation bloody serum was aspirated from the left thorax. The patient died of internal metastases, February 12, 1916.

CASE 3. Marjolin's ulcer; with pelvic metastasis. Repeated operations and recurrences. Death from shock.

Pemberton H., age 52, was admitted to the Samaritan Hospital, October 6, 1915, with a diagnosis of Marjolin's ulcer and inguinal metastasis. Thirteen years before, the patient fell down stairs injuring his right foot. This healed after an operation and he was able to walk, but two or three years later the leg ulcerated and never healed. About one year ago the ulceration increased, and one month ago the leg became very painful and walking was difficult. Recent loss of weight.

Operation (Dr. Steel) October 8, 1915. Excision of ulcer and inguinal glands; prompt recurrence. Operation (Dr. Emich) October 18, 1915, amputation above knee; recurrence. Operation (Dr. Steel) January 7, 1916, excision of carcinomatous ulcer of groin, prompt recurrence, foul malignant ulcer. Operation (Dr. Babcock) February 2, 1916: Advanced pelvic involvement, emaciation and cachexia. Interilio-abdominal amputation and right castration, disarticulation of right innominate bone and high removal of soft parts. Death followed from shock shortly after the completion of the operation (Figs. 23 and 24).

A NEW METHOD OF TYING A SURGICAL KNOT[1]

BY A. R. GRANT, M.D., UTICA, NEW YORK

THE history of the method described below of making a rapid and secure surgeon's knot is the outcome of many experiments induced by dissatisfaction with all of the older methods of one hand and two handed ties. The salient features are the use of one very short end, the shorter the better, and a needle holder or any artery clamp or needle forceps.

The credit of the idea of using forceps instead of fingers should be given, I believe, to Dr. A. L. Soresi of New York, now serving with great distinction in the Italian Army. Dr. Soresi published an article several years ago describing a method of making a knot when the suture had been broken off. Surgeons use forceps in certain cases, but I find nothing in the literature describing this method and its universal application.

To tie a clamped blood-vessel. A fourteen inch ligature is clamped at its end by a forceps or needle holder held in the right hand. The left end is held by the third, fourth, and fifth fingers of the left hand or by another forceps. With the thread held by the last three fingers of the left hand or forceps, the shaft of the artery clamp is picked up with the thumb and forefinger of the left hand and the right end of the thread is passed from right to left behind the artery clamp so that both ends are on the same side of the clamp, i.e., the left side: at the moment of passing the ligature the assistant slips thumb and finger through the openings of the clamp preparatory to unlocking and removing it. The longer left end is pulled upon until the right end is only half an inch from the tip of the artery clamp. The operator now lets go the short end of the thread held with the forceps in his right hand and lays the point across and on top of the thread near and pointing at the

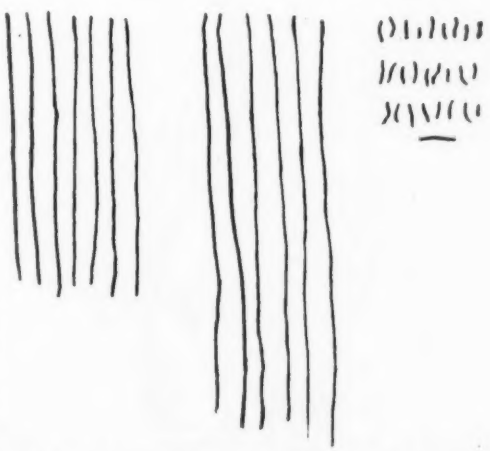
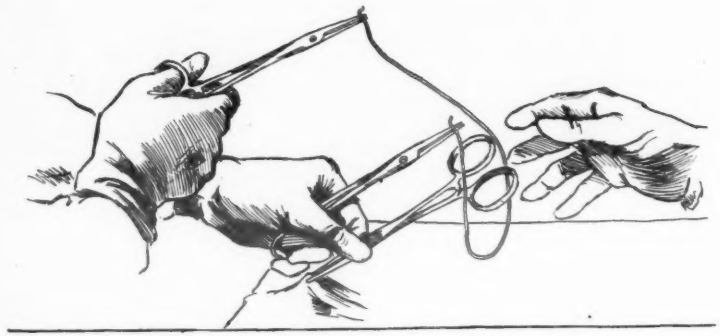


Fig. 1. Economy of new tie using one 28-inch catgut strand. *a* (at left), One hand tie 6 knots and waste; *b*, two hand tie 3 knots and waste; *c*, new tie, 26 knots and waste.

[1] Read at the annual meeting of the Pennsylvania-New York Interstate Surgical Society, Scranton, November 9, 1917.



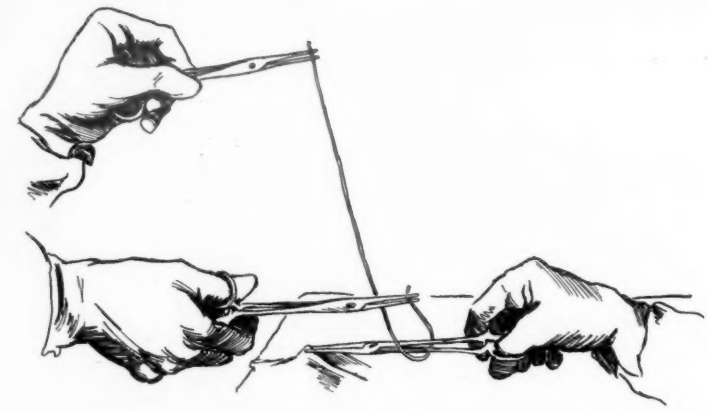


Fig. 2 (above). Lifting hæmostat with left thumb and finger. Ligature passing behind haemostat.

Fig. 3. Hæmostat transferred to assistant. Traction on left end draws loop around tip of hæmostat and artery.

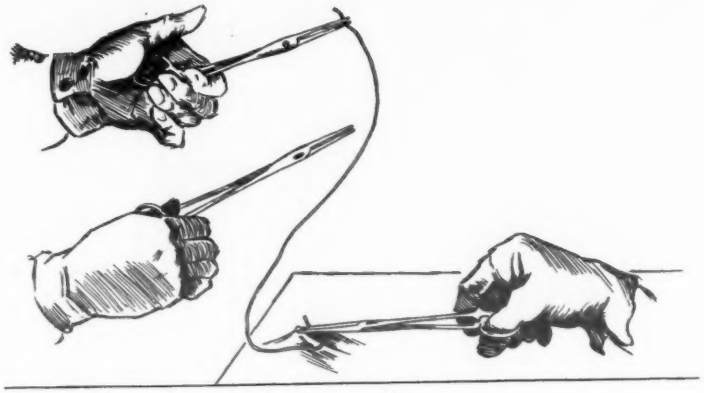


Fig. 4 (above). Short end of ligature at left side of hæmostat.

Fig. 5. Forceps in right hand laid over ligature, tip pointing upward. If tip points downward no loop is possible.

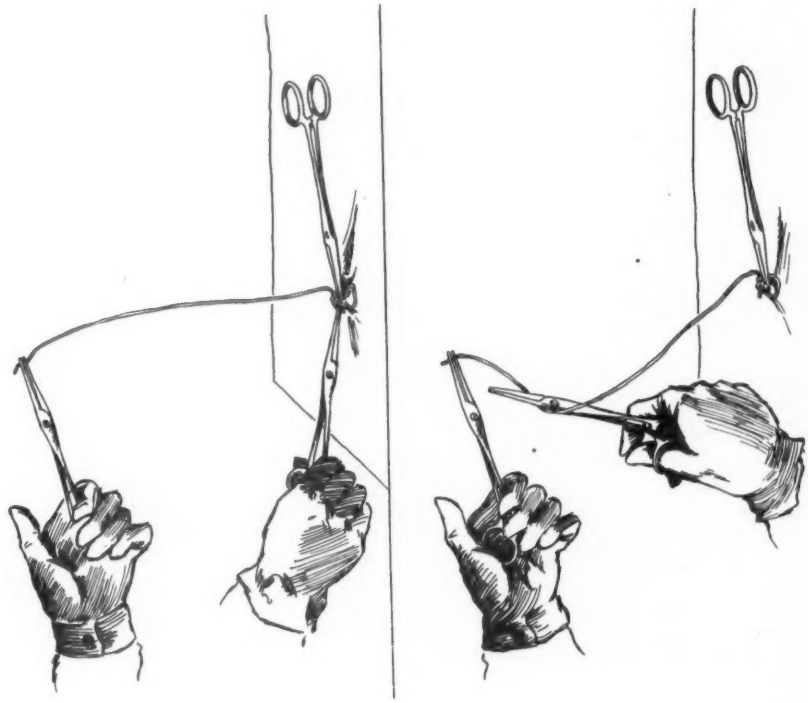


Fig. 8 (above). Note contiguity of tips of right hand forceps and hæmostat. First half of knot completed but loosely drawn.

Fig. 9. Right hand forceps placed beneath thread, tip pointing upward; this loop completes a square knot.

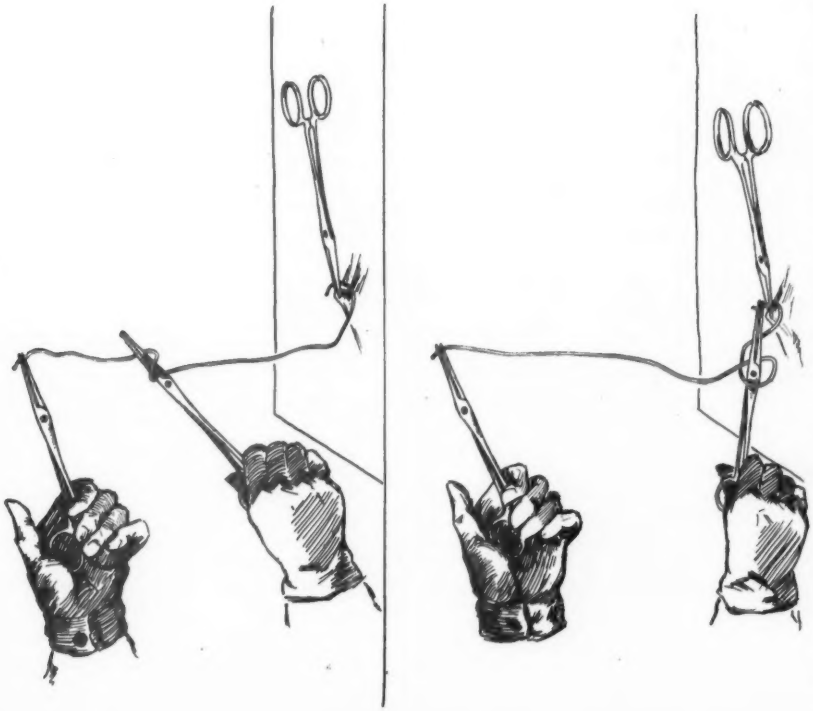


Fig. 6 (above). Loop completed. Forceps in right hand starting toward short end.

Fig. 7. Loop completed. Forceps grasping short end firmly; left hand pulling long end over tips of forceps in right hand.

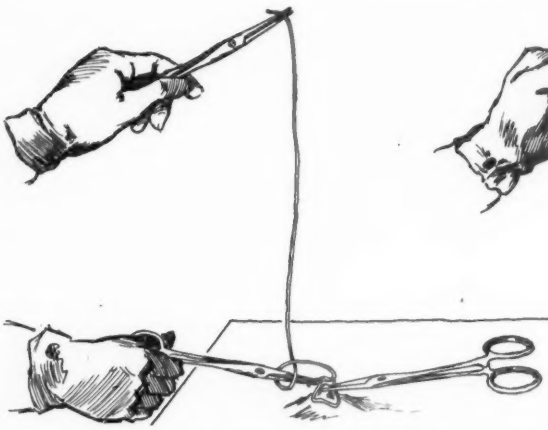


Fig. 10. Left hand drawing down second loop.

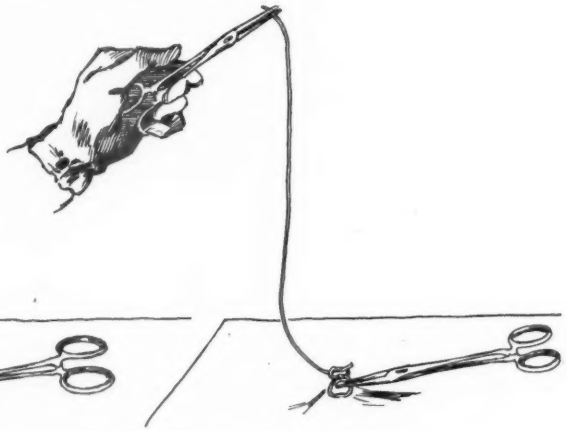


Fig. 11. Square knot completed; no hand touch technique throughout.

left thumb; he then carries the point downward and underneath the thread, which makes a loop around the forceps and catches the very tip of the short end of the thread and draws it down snugly over the clamped artery as the assistant releases the clamp: this makes the first half of the knot. The forceps is then placed beneath the thread pointing toward the left forefinger and is passed upward and then toward the surgeon, and then downward and away to pick up the short end and draw the second half of the knot fast.

If a third knot is required for security, place the forceps on *top* of the thread and make another loop, which completes another square knot..

The surgeon may easily demonstrate the fact that it *is* a square knot that he has tied.

When a true surgeon's knot is required the first loop is made by two circles of thread, after which the second and third single turns are made as before.

Transfixion and interrupted sutures with needle and needle holder. The only special point in the smooth technique of transfixion and approximation sutures, is to sew *toward* the operator, which brings the tension in alignment without crossing hands.

Such interrupted stitches may be placed and tied very rapidly (and are usually better technique than a continuous running suture), obviating the usual custom of laying down the needle holder and tissue forceps and needle before tying the knot and then picking them all up for another suture.

Instruments. Any dissecting forceps, artery clamp, or needle holder may be used for the purpose, no special type of instrument being necessary for its performance. I have found, however, that a needle holder of the taper nose variety like Ferguson's or Hegar's is best with all varieties of needles and all kinds of suture material.

Any size of ligature from the largest catgut to the finest silk, wire, or human hair, can be easily handled and visible knots applied in every situation better than can be made by the fingers.

"Safety first." The knot is always visible in the making and therefore accurate and secure. Breakage is almost eliminated because necessary tension can be most delicately estimated.

Universal applicability. In any region, however small and deep that can be visualized, this knot may be accurately tied. In the pelvis, vault of the vagina, rectum and bladder, underneath the liver, in the throat and pharynx, it may be tied as easily as on the surface.

Time saving. Rapid and accurate transfixion and knotting may be done without laying down needle and needle holder, which is an important consideration in dissections requiring many hæmostats.

"No-hand-touch" technique. There is no doubt as to the superiority of this method when the operator aims at a "no-hand-touch" technique, for with a Ferguson needle holder and an ordinary needle forceps, transfixion sutures may be quickly and accurately placed without hand contact with either sutures or tissues.

Economy. By the use of this method the economy of suture material is almost unbelievable.

By comparison: one 28-inch catgut strand as ordinarily cut into three pieces by the instrument nurse for the surgeon who ties with two hands, gives three knots. The operator who uses the one-hand tie and economizes, can get six knots from one strand.

The same skill with the new tie will give 20 to 25 knots with a 28-inch strand. In other words, one can tie as many knots with one tube of gut as can be tied with three or four tubes by the older method.

Infection. Serious consideration of the origin of occasional wound suppuration leads to the conclusion that much contact and manipulation of ligatures with the fingers of the nurse and surgeon, is the greatest source of infection: it may be easily demonstrated that from 75 per cent to 100 per cent of hand contact with ligatures will be eliminated by this method.

CONCLUSION

In general one may say that one-half of a surgical operation consists in good exposure and ablation of pathological tissues; the other half consists in hæmostasis and coaptation of normal tissues; therefore, an ideal knot means that the technique in 50 per cent of all operations will be advanced and refined. I believe this knot will become standard technique with every surgeon who will trouble to verify its multiple advantages.

A MODIFICATION OF THE AHLFELD METHOD FOR DETERMINING THE MATURITY OF THE FŒTUS IN UTERO

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Attending Obstetrician, Grace Hospital

ONE of the most interesting and at times one of the most trying problems that confront the obstetrician is the determination of the size and maturity of the fœtus *in utero* during the latter weeks of pregnancy. It is a fact that although most men doing obstetrical work realize the importance of careful pelvic measurements, yet little or no attention is given to estimating the size of the fœtus *in utero*. Of course, it is obvious that it is the adaptability of the fœtus to the bony pelvis that makes normal birth possible. Therefore, it often becomes as important for the physician to know something of the size and maturity of the fœtus *in utero* as to have knowledge of the dimensions of the maternal pelvis.

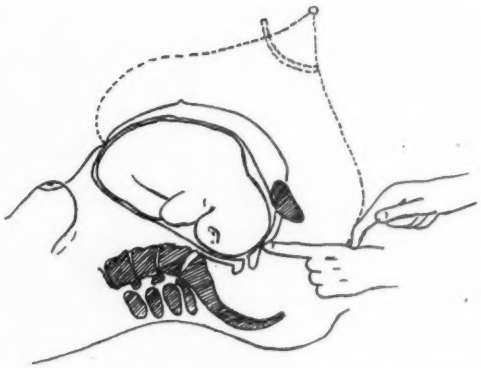
Not only in abnormal conditions associated with pregnancy is the knowledge of the maturity of the fœtus valuable, but in the normal patient this knowledge at times becomes most valuable in determining the approximate date of confinement.

In many instances little or no reliance may be placed upon certain facts pertaining to the obstetrical history, such as the date of the last menstruation, date of quickening, etc., as a means of determining the age of the fœtus *in utero*. These events are often forgotten or never taken note of by the patient, and calculation based thereupon becomes guesswork.

At present there are three more or less common methods for estimating the maturity of the fœtus and these are known as the Ahlfeld, McDonald, and Perret methods respectively. Concerning these it may be said that they are all valuable aids toward securing the information sought but it may likewise be stated that they each possess certain disadvantages which under certain conditions render their use ineffectual.

The first named method appears to be the most valuable. This method is based upon the fact that the fœtus at full term is 50 centimeters in length. It is or should be generally conceded that the length of the fœtus or newborn child rather than the weight is the best index for determining the maturity, a fact recently emphasized by Reed (1).

Ahlfeld (2) pointed out that the true length of the child is twice that of the distance from the vertex to the buttocks of the child in the position normally assumed *in utero*. This he determined by measuring externally with a pelvimeter from the upper border of the symphysis which is supposed to be at the level of the vertex, to the uppermost point of the buttocks as palpated and measured through the abdominal wall. Two centimeters are deducted from this finding to allow for the thickness of the abdominal and uterine walls and the result multiplied by two for the final reading.



Line drawing showing pelvimeter in position for measuring distance from upper fœtal pole to arbitrary point on examining hand. Later the distance from the arbitrary point to tip of examining finger is measured and this subtracted from first reading.

The obvious disadvantage of the method lies in the fact that in many cases during the latter weeks of pregnancy, the vertex enters the birth canal and may be at a level with the spines if the head is engaged. To overcome this disadvantage Ahlfeld used in these cases a pelvimeter with excessively curved blades. With the fingers in the vagina against the vertex one tip of the pelvimeter is passed along the fingers until it rests against the vertex through the thickness of the cervix and the reading is made. The disadvantages of this latter procedure are manifest. First, a vaginal examination must be made, which especially at the time of labor may not be desirable. Second, a special instrument is required, which must be sterilized at each examination. Third, the manipulation of such an instrument in the vagina in the latter weeks of pregnancy must not only increase the likelihood of infection but must be more or less painful to the patient.

In the modification of the Ahlfeld method here to be described all of the above disadvantages are obviated and the method made of much more practical use.

The other methods referred to will be spoken of but briefly. The McDonald method is calculated from the distance measured with a tapeline from the symphysis to the uppermost point of the fundus uteri following the curve of the abdomen. Without going into detail the objections are, first, the size of the uterus is influenced not only by the size of the fœtus but also by the amount of liquor amnii present. Second, in the latter weeks of pregnancy owing to variation in the position of the vertex, which may be much below the level of the symphysis, the method becomes at once faulty.

The Perret (3) method has to do only with the calculation of the biparietal diameter of the fœtal head. In order to employ this method the head must be freely floating above the symphysis and as soon as the vertex enters the birth canal the method is not applicable.

The modification of the Ahlfeld method here proposed may be described as follows: The patient is placed in the lithotomy position for the ordinary vaginal examination. The examination may be conducted either vaginally or rectally. If the head is high up and cannot be reached per rectum the vaginal route becomes necessary. If, however, the vertex can be palpated at all per rectum the rectal route becomes preferable not only on account of the lessened danger of infection but because the examining finger is in the extension of a line corresponding to the axis of the fœtus *in utero*.

For purposes of description and illustration the vaginal route will be described. An examination is made in the usual manner passing the finger or fingers to the cervix. If the vertex (or breech) is in the birth canal it may be easily palpated through the anterior fornix. If the presenting part is too high up, slight pressure by an assistant upon the fundus toward the symphysis will bring the presenting part down so that it may be palpated.

With the examining hand in position, the finger resting against the fœtal head and in a line corresponding with the longitudinal axis of the fœtus, an assistant measures with a pelvimeter the distance from the uppermost point of the buttocks through the abdominal wall to any easily available point on the examining hand outside the vulva. The index finger of the other hand of the examiner is now placed at this point against the tip of the pelvimeter (see illustration). The reading is made and with the fingertip of the non-examining hand still in position the examining hand is withdrawn from the vagina. The distance from the tip of the examining finger to the point where the pelvimeter rested is now measured. This reading subtracted from the former reading will give the distance from the vertex to the uppermost point of the buttocks after subtracting a small amount for the thickness of the abdominal and uterine walls.

If the examining finger has rested against the fœtal head itself through a patent cervical canal, it is my custom to deduct 1.5 centimeters before multiplying by two as in the Ahlfeld method. If,

however, the palpation has been made through the anterior fornix, either rectally or vaginally, 2 centimeters are deducted. Of course, further observation may necessitate a change in either or both of these two figures but up to the present time in the cases where measurements have been made before and after birth the results have been gratifying.

The employment of the rectal route is obvious and requires no further description. In conclusion it may be stated that the modification of the Ahlfeld method here presented possesses the following advantages:

1. The length of the folded child *in utero* may be determined with greater accuracy than in external abdominal methods.

2. The method becomes of wider use, no special instruments being required.

3. The method is a rapid one and conflicts in no way with aseptic technique.

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THE EXCISION AND SUTURE OF SUPERFICIAL GUNSHOT WOUNDS UNDER LOCAL ANÆSTHESIA

BY LIEUTENANT SAM BROCK, M. R. C., U. S. A.
No. 9 (Lakeside, U. S. A.) General Hospital, France

THE advantages of the early excision and suture of superficial gunshot wounds under local anæsthesia are: first, it makes possible many minor operations which ordinarily would not authorize a general anæsthesia; second, it saves dressing material; third, it prevents the formation of scar tissue; fourth, it saves time, the most potent factor in war surgery.

Superficial gunshot wounds may be classified as penetrating, perforating and gutter, and are caused in the majority of cases by high explosives. They are all more or less infected. A high explosive, bursting into many fragments and traveling at a comparatively lower velocity than the bullet, causes ugly gashes, tearing and devitalizing the tissues and depositing along its course fragments of clothing, earth, and débris. The rifle bullet wound is comparatively clean and usually can be distinguished from the shrapnel wound.

Superficial wounds are frequently given little consideration at the Casualty Clearing Stations. A hasty dressing, dry, or moistened in eusol, is applied, or the wound is "bipped." The patient arrives at a Base Hospital within 24 to 48 hours. Many wounds show marked infection by this time; others with less ample drainage require immediate operation.

The most insignificant looking high explosive or shrapnel wound of the penetrating and perforating types may cause serious consequences. The gutter wound usually takes care of itself. The early suture of any gunshot wound which cannot be kept under observation, is rarely justifiable. Many wounds sutured at the Casualty Clearing Stations require immediate removal of sutures when the patient arrives at the Base Hospital.

The possibility of excision and suture of any superficial wound depends on its size and location. Those areas where skin flaps are most readily secured, facilitating approximation with a minimum degree of tension, heal most rapidly.

Many wounds can be excised completely intact. Such wounds may be closed without fear of subsequent infection. Many wounds that have been excised *en masse* at the Casualty Clearing Station have been closed successfully shortly after arrival at the Base.

Even when dressed every day, the average superficial unsutured wound requires from 3 to 6 weeks to heal. The time saved in the healing of these wounds by excision and suture is apparent. The dressing material saved is considerable. The earlier the wound can be sutured the better. After two weeks, enough scar tissue has been formed to make excision difficult.

The superficial wounds shown in the accompanying illustrations were excised and sutured after 4 to 6 days' treatment. The operations

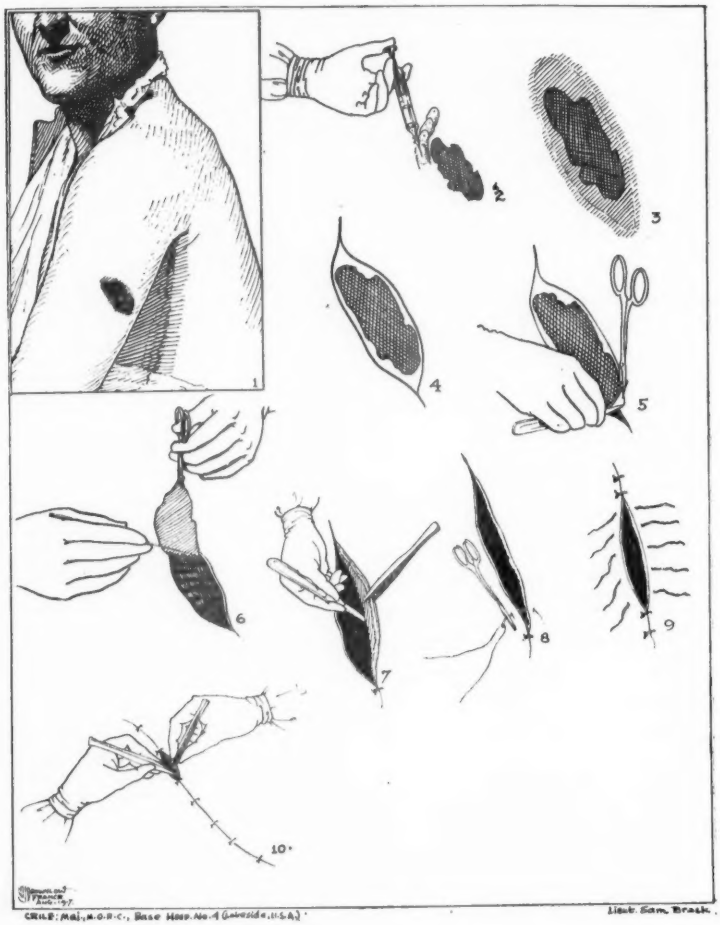

Fig. 1. High explosive wound. Skin prepared with iodine and alcohol.

Fig. 2. Injecting novocaine, 1:200.

Fig. 3. An area 5 centimeters in width is blocked.

Fig. 4. In order to obtain an elliptical wound, it is often necessary to begin the line of excision farther away from the wound than the condition of the tissue itself demands.

Figs. 5 and 6. The excision of the wound *en masse*.

Fig. 7. It is advisable in all cases to make skin flaps, as this procedure lessens tension and tends to prevent inversion of skin edges.

Fig. 8. Silkworm-gut suture material is employed. The end sutures are placed about 2 centimeters from the beginning and end of the incision, which procedure prevents puckering at the ends.

Fig. 9. Sutures are placed loosely at 2 centimeters intervals or wider, and about 3 centimeters from the margin of wound. The dead space is eliminated by including deeper tissues.

Fig. 10. Skin edges everted. Alcohol dressing.

Fig. 11. Shrapnel wound after 6 days' treatment, and 6 days after excision and suture.

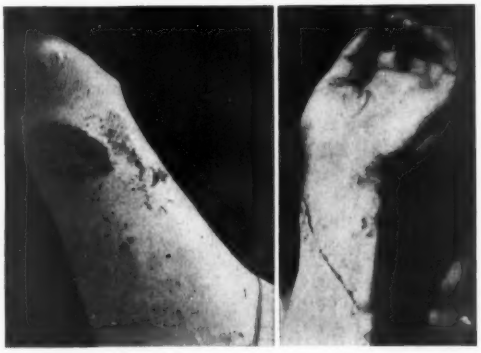

Fig. 12. High explosive wound after 4 days' treatment, and 7 days after excision and suture.

were done in a clean theater where no pus cases were handled. The time for operation was determined by the gross macroscopic appearance of the wounds, no cultures having been made. The patients were not confined to bed, but came to the dressing tent, after as well as before operation. It was found, however, that wounds of the arm, put at rest with splint and sling, made more rapid recovery. Wounds of the face and neck without exception healed by first intention.

Novocaine 1:200, properly infiltrated, produces complete anæsthesia. An area 5 centimeters in width can be blocked in one line about the wound.

TREATMENT

The infection was controlled by the use of hot dressings and subsequently 65 per cent alcohol dressings. Gauze was boiled in 4 per cent boric solution, wrung out and applied to the wounds. Dressings were changed three times daily. The superficial infected wounds usually cleared up under this treatment in two to three days. Sixty-five per cent alcohol dressings were then substituted and applied twice daily for two to three days. In many instances where contamination had not progressed to infection, alcohol dressings were employed from the beginning. Whenever feasible, the wounds were exposed to the rays of the sun for an hour daily. When the granulating tissue had assumed a healthy appearance, and there was no further discharge, which was usually the case within four to six days, excision and suture was done. Most of the wounds were excised *en masse* by block dissection.

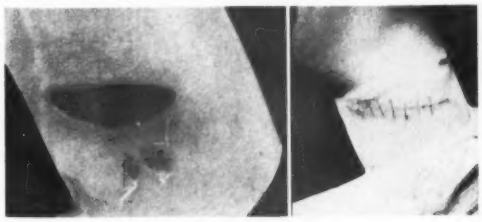

Fig. 13. High explosive wound, after 5 days' treatment, and 6 days after excision and suture.

Fig. 14. High explosive wounds after 6 days' treatment, and 4 days after excision and suture.

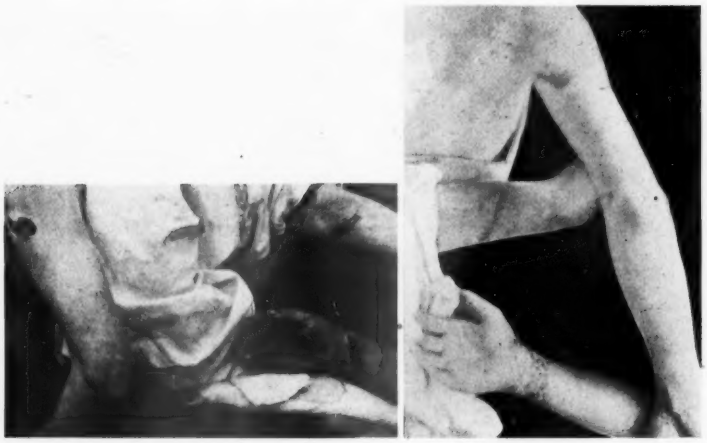

Fig. 15. Shrapnel wounds after 4 days' treatment, and 7 days after excision and suture.

It is not advisable to remove sutures before the eighth day in the majority of cases, and even then alternating sutures in many wounds.

During the months of June, July, August, September, and October, 1917, 294 wounds were excised and sutured under local anæsthesia. Of these primary union resulted in 95+ per cent.

NOTE.—I am indebted to Major George W. Crile, M.R.C., and Major Wm. E. Lower, M.R.C., for suggestions.

CHORIO-ANGIOPAGEN

BY ISIDRO AYORA, QUITO, ECUADOR

ON February 24, 1917, Maria C., age 28, I-para, entered the Quito Maternity. The woman was mentally deficient and was scarcely able to express herself about the simplest matters relating to her condition. She had forgotten the date of her last menstruation. Examination revealed a generally contracted pelvis and the abdomen but little developed. From 6 a.m. up to the time of entrance at 6 p.m., she had had uterine contractions of increasing intensity. The base of the uterus was two fingers' breadth below the umbilicus. Fœtal sounds were not perceived. External examination was rendered very difficult by an extremely tense abdominal wall. At 2 a.m. on the 25th, 20 hours after onset of labor, two fœtus and secundines were delivered abruptly in a single effort. The following was noted regarding the specimen:

They are female fœtus, macerated, one weighing 900 grams, the other 500 grams. The first appears somewhat œdematous, especially about the abdomen; the other has the appearance of a fœtus papyraceus. Neither presents any other morphological anomalies.

From the umbilicus the cords were interlaced in the following manner: first, a four spiral twist, then a conglomeration of five or six knots very difficult to untie, and finally a five spiral twist which continued almost to the placental insertion. The cord of the smaller child was inserted in the membrane one centimeter from the placental edge, the other was inserted into the placental margin, five centimeters from the velamentous insertion. The cord of the smaller fœtus had two parts, one extending from the velamentous insertion up to two centimeters of its umbilical insertion. This portion of the cord was reddish in color, as if the circulation had been maintained until recently. The other portion from here to the umbilicus was of a grayish color, very slender, and twisted upon itself, as though all circulation might have ceased therein for a long time. It presented the appearance of strangulation two or three centimeters from the umbilical insertion by the twists of the other umbilical cord. The result was that the smaller fœtus died long before the other, that is to say, it was murdered by its twin sister. This would appear to be an edifying example of how much members of the fair sex love each other. It is probable that the circu-

Fig. 1.

Fig. 2.

lation in the cord from the placental insertion up to the strangulation point was reversed and maintained by the other fœtus' heart, the blood crossing the vascular anastomoses in the placenta, which constitutes the third circulation observed on its inner face, once the amnion is separated. This anastomosis was palpably dilated, which would seem to indicate that during the time that the larger fœtus survived the other, a reversed circulation was present in the cord of the dead fœtus, which would have become an acardiac, had the circulation in its cord not been completely interrupted. The fœtal cord of the larger child presented two parts, one from the placental insertion up to two centimeters from the umbilicus (being a reddish color and of normal thickness) the other, i.e., 2 centimeters up to the umbilicus, was twisted upon itself so pronouncedly that it must have ultimately produced circulatory interruption and resultant death of the surviving fœtus. Perhaps the larger fœtus survived the smaller by 3 or 4 weeks.

The placenta is interesting. It is nearly round, 11x12 cm. diameter, 1.5 thick, and weighs 500 grams, which compared to the combined weight of the twins shows considerable development. The amnion forms a crestlike fold on the larger diameter of the placenta. On removal it exposes clearly the anastomosis of the arteries of one cord with those of the other, forming thereby an oval upon the placenta (see Fig. 2). Consequently a third circulation is clearly present in this case.

The membranes are complete, with a single cavity which encloses the fœtus and accommodates within its walls for one centimeter of its length the smaller fœtal cord. The rupture is lateral. Without any great difficulty it was possible to separate the chorion from the amnion.

This clearly is an example of monochorial twins, and of the extremely rare variety of monoamnioticos. The above mentioned amniotic fold was not the remains of an atrophied wall, but was a fold arising from a reduction in the volume of the placenta, because upon separating the amnion therefrom the continuity of the amniotic membrane is restored without any signs of discontinuity. If the said fold had been the remains of an amniotic wall primitively separating the fœtus, it would not have been possible to restore the amnion in its continuity as indicated.

The woman was released on the tenth day in healthy condition.

TREATMENT OF CYSTOCELE AND UTERINE PROLAPSE DURING THE CHILDBEARING PERIOD[1]

By THOMAS J. WATKINS, M.D., F.A.C.S., Chicago

THE transposition operation is, I believe, the ideal remedy for cystocele and uterine prolapse after the menopause. This paper will be limited to the treatment of cases that can be relieved by operations which do not endanger pregnancy or labor. Fortunately, only a small percentage of cases of cystocele and uterine prolapse occurring during the reproductive period are so extensive as to require more radical procedures.

Important progress has been made in recent years in plastic vaginal operations for these displacements, and much of this work is rapidly becoming standardized. I am pleased to avail myself of this opportunity to commend the work of R. T. Frank upon the anatomy, pathology, and treatment of cystocele and uterine prolapse, recently published in Surgery, Gynecology and Obstetrics.[2]

Much of the difficulty encountered consists in adapting the various operations to the needs of individual cases. Cystocele and uterine prolapse are easily repaired, but permanent cures are not so readily obtained. An important requirement is to obtain lines of union not subject to much tension; otherwise the united tissues are certain to stretch and recurrence to take place.

Operations for these displacements are always handicapped, as the united surfaces are subjected to more or less tension when the patient is in the erect position; the tissues involved are often congenitally weak, are always lacerated, stretched and thinned, and are generally subjected to pressure from above by superimposed prolapsed organs.

It is my intention in this paper to describe various operative procedures which can be utilized singly or collectively to the needs of individual cases of cystocele and uterine prolapse.

Transverse incision. The transverse incision in front of the cervix should extend freely across the anterior vaginal wall to permit the cervix to tilt easily upward and backward as the operation progresses. This lengthens the anterior vaginal wall and allows the body of the uterus to drop forward without undue flexure. The anterior vaginal wall is often congenitally or otherwise shortened in these cases.

Emmet, Skene, Baldwin, Reynolds, and others have emphasized the importance of lengthening the vaginal canal in the repair of these displacements.

Separation of the anterior vaginal wall from the bladder. Blunt dissection with Mayo scissors saves time, and lessens bleeding and traumatism if care is taken to find the plane of fascia between the vagina and bladder. The width of the separation varies. It should not be wide enough to endanger the ureters or injure large veins, yet should include all redundant mucous membrane and should permit complete separation of the herniated part of the bladder.

Separation of the bladder from the cervix. This is also most satisfactorily done with scissors, if caution is taken to find the dividing plane of fascia. The herniated portion of the bladder should now be completely freed from the sac (Fig. 2, 2).

The peritoneum is incised if the cystocele is large, if intraperitoneal exploration is desired, if the uterus is retrodisplaced, or if vaginal fixation of the round ligaments is contemplated.

At this time amputation of the cervix, if indicated, is done. We believe in amputation in occasional cases of excessive elongation of the cervix *only*, because it endangers labor and stenosis.

Plastic operations upon the broad ligaments. Plastic operation on the broad ligaments is a valuable adjunct to the operation, if the uterus is much prolapsed, much increased in size, or if the anterior vaginal wall is much shortened.

The anterior elytrorrhaphy of Emmet, the bilateral colporrhaphy of Watkins and Dudley, and the Baldwin operation are largely broad ligament operations.

Statistics and other reported results of the Baldwin operation are excellent.[3] In the Baldwin operation the vaginal wall is generously buttonholed to either side of the cervix, through which loops of the broad ligament are freely pulled out and firmly fixed, by sutures, anterior to the cervix. The "bladder pillars of fascia" are also accurately sutured in the median line the entire length of the anterior vaginal wall, and a firm posterior colporrhaphy is made. Baldwin has the cervix firmly retracted upward and backward while

[2] January, 1917.

[3] N. Y. M. J., 1912, Nov. 9.

[1] Read before the American Gynecological Society, Pittsburgh, May 31, 1917.

the anterior vaginal wall operation is made (Fig. 2, *4*).

The plastic operation upon the broad ligaments lengthens the anterior vaginal wall, shortens the broad ligaments and thereby elevates the uterus in the pelvis, increases the anteversion of the uterus, thus lessening intra-abdominal pressure, decreasing the amount of tension upon the united tissues, lessening the tendency of the line of union to stretch, and materially insuring a permanent result. Suturing is made of firm tissue securely fixed, which is an important feature in plastic vaginal surgery.

Vaginal fixation of the round ligaments. The technique is much the same as was formerly employed in the treatment of retropositions of the uterus. It is especially valuable when the prolapse is complicated by backward displacement of the uterus. It is also of great value in cases of extensive prolapse of the uterus. It adds materially to our ability to cure some of the very bad cases without subjecting them to operations to produce sterility.

The round ligaments are not long enough for vaginal fixation without undue tension, except when the uterus is retrodisplaced or much prolapsed.

The ligaments should be firmly fixed to the submucous connective tissue by interrupted, buried, fine linen or silk suture at a place in the vaginal wall that will restore and fix the urethrocele, which is almost invariably present, to its normal location. The point of fixation will be further considered later.

Advancement of the anterior vaginal wall upon the uterus. This consists in changing the place of attachment of the vaginal wall to the uterus to a plane higher on the uterus than formerly occupied, as devised by Goffe. The more the vaginal wall is advanced upon the uterus, the more certain must be cure of the bladder and uterine displacements. The possible danger consists in complicating pregnancy and labor. As regards pregnancy and labor, it is not safe to attach the vagina much higher than the anterior reflexion of the peritoneum.

Excision of vaginal flaps. Redundant tissue should be excised to an extent consistent with minimum tension upon sutures. The hypertrophied mucosa (skin-like tissue) which is generally present over the base of the urethra should be excised, otherwise it is liable to protrude later and annoy the patient.

Sutures. We believe it advisable to use interrupted, buried, fine linen or silk for suture of the broad ligaments, for suture of loops of the round

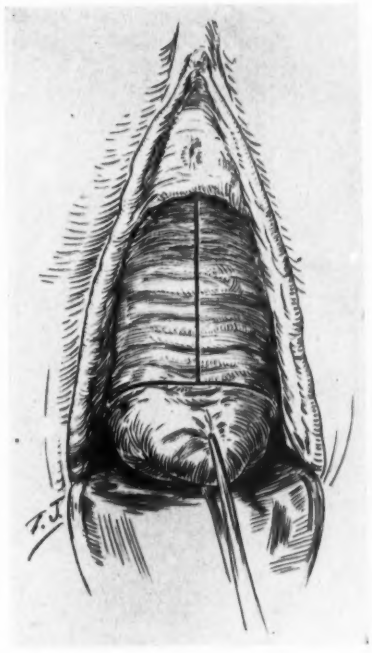

Fig. 1. Illustrates the lines of incisions which are made during the operation.[1]

ligaments, and in exceptional cases to use two or three such sutures in the submucous connective tissue. Otherwise Claudius catgut is used entirely, interrupted or continuous as seems best adapted to conditions. Some interrupted sutures lessen the danger of retained wound secretion, decomposition, and febrile disturbances.

Placing of sutures. Hæmostasis should receive very careful attention before the wound is closed, as it determines very largely the character of the convalescence.

The part of the wound caused by excision of the hypertrophied mucosa over the base of the urethra is closed first. The placing of the first "circular" suture is highly important, as it determines the place the urethra will be left in, it closes all or most of the hernial opening of the cystocele, and it should insure an anterior position of the uterus. It should include the place in the vaginal wall, so that when tied it will restore the urethra to its normal location, which is one of relative fixation. (This invariably relieves the partial incontinence of urine which so often results from urethrocele.) The suture should pass

[1] Illustrations are from the *Surgical Clinics of Chicago.*

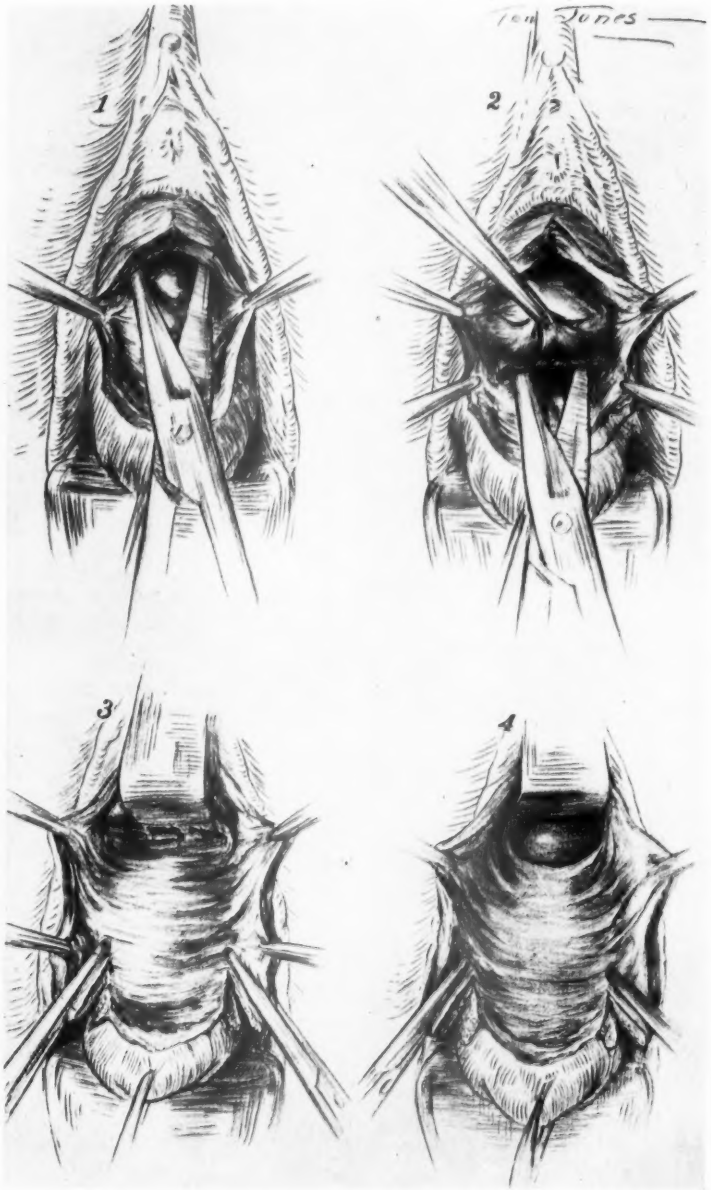

Fig. 2, 1. The transverse line of incision has been made. The vagina is being separated from the bladder by blunt dissection. Median incision is partially made. 2. Median incision is completed. Bladder is separated from the cervix along the dividing plane of fascia by blunt dissection. 3. Portion of both broad ligaments have been clamped and incised. Bladder is held by retractor. 4. Bladder is lifted by retractor and peritoneal cavity has been opened. Anterior uterine wall is exposed.

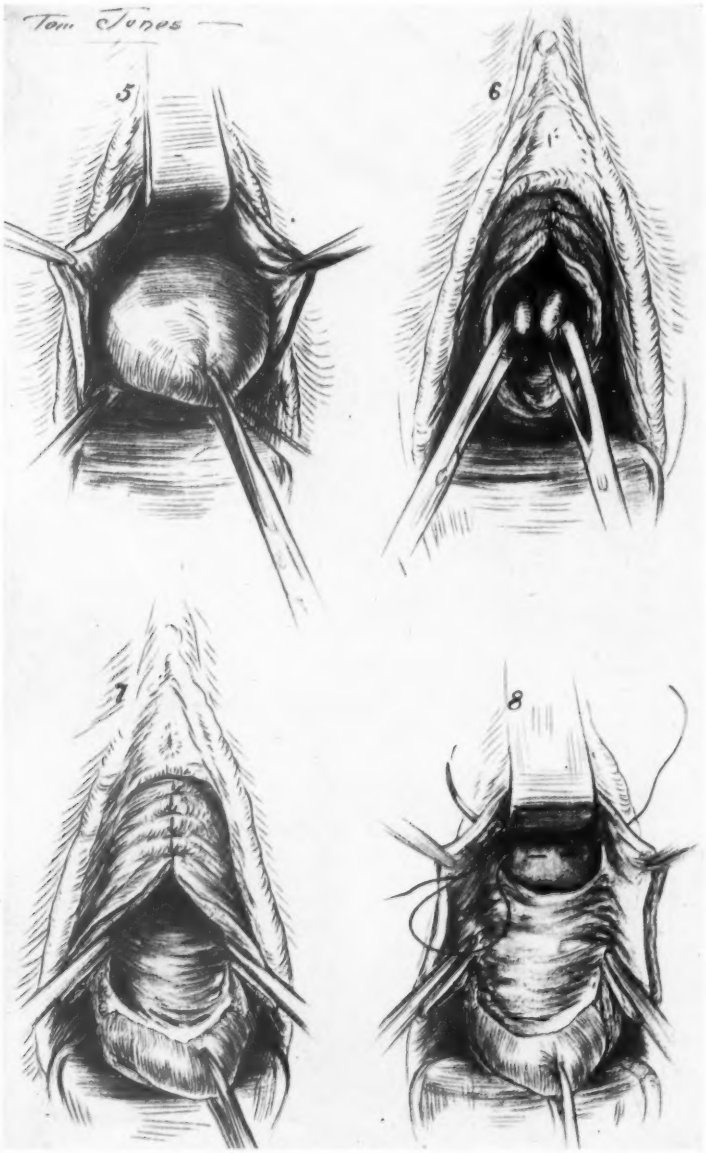

Fig. 3. *5*, The body of the uterus has been delivered into the vagina. The fundus is held by bullet forceps. *6*. The round ligament has been grasped on either side and a loop of each round ligament appears in the vaginal wound. The hypertrophied tissue over the base of the urethra has been excised and the wound over the body of urethra closed by suture. *7*. The loops of round ligament have been sutured by buried fine linen or silk to the submucous connective tissue and the closure extended. *8*. Illustrates the first circular suture which closes the hernial opening, restores urethra to normal location, and keeps uterus in anterior position.

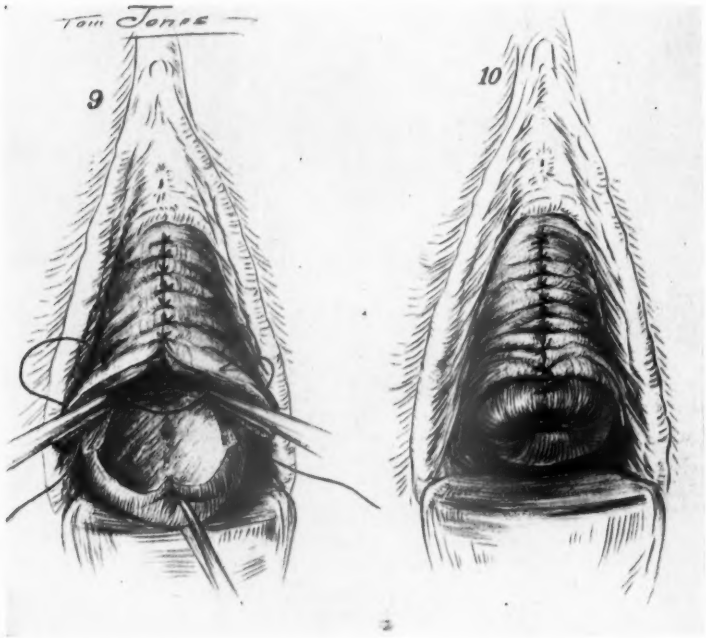

Fig. 4, *9*. Closure of wound has been extended. A V-shaped piece of the anterior lip of the cervix has been excised. The suture inserted is of the mattress type and unites the cut portions of the broad ligaments anterior to the cervix. *10*. Completed operation on the anterior vaginal wall.

through the anterior surface of the uterus at a place above its point of pivotal action when tipped forward or backward, so that when tied it keeps the body anteriorly. If placed below such a point it would tend to pull the cervix down and to tilt the body back. When tied, care should be taken not to include a knuckle of the bladder. In extensive cases this should be a buried linen or silk submucous suture. Succeeding sutures should parallel this one at short distances until the wound is closed.

Accurate suture of the submucous connective tissue is highly important.

Trachelorrhaphy. Before complete closure of the wound is the most convenient time to make any necessary repairs of the cervix. These may be unilateral or bilateral. Complete amputation of the anterior lip, with or without wedge-shaped excision of the posterior lip, may be required.

Perineorrhaphy. Perineorrhaphy is usually indicated and is necessary to a satisfactory result.

Vesical irritation. These patients almost invariably have a history of more or less bladder distress. They often neglect to mention it in their history unless questioned especially in regard to it. We have found, at Dr. Curtis' suggestion, that the vesical disturbance is often the result of incomplete emptying of the bladder. Our present custom is to test this by catheter immediately after urination, and to leave a weak solution of silver in the bladder after it is emptied. Catheterization immediately after urination, followed by silver nitrate instillation, is repeated daily until the emptying power of the bladder becomes normal.

SUMMARY

Wide incision anterior to the cervix, free separation of the herniated part of the bladder, closure of the hernial opening by circular sutures, restoration and fixation of the urethrocele, and perineorrhaphy are essential features in the operation.

Amputation of the cervix, trachelorrhaphy, plastic surgery on the broad ligaments, and vaginal fixation of the round ligaments are adjuncts which can be utilized as necessary.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD DECEMBER 7, 1917, WITH THE PRESIDENT, DR. CARL BECK, IN THE CHAIR

DEMONSTRATION OF PATIENTS

DR. CARL BECK showed a case of amputation of the shoulder girdle and discussed the possibilities of plastic operations to fit an artificial stump. He also showed a case of plastic operation on nose and ear.

TRANSPLANTATION OF FASCIA FOR LYMPH STASIS

DR. JOHN F. GOLDEN discussed the transplantation of fascia for lymph stasis.

DISCUSSION

DR. E. WYLLYS ANDREWS: The operation of Handley or modifications of it do not give so favorable results in my experience as those of the Kondoleon operation. With the latter I have had 50 per cent successful results, and 50 per cent partial failures. Kondoleon is a Greek surgeon. The technique of the Kondoleon operation I demonstrated at the Clinical Congress in October. Perhaps some of the men present saw that demonstration at Michael Reese Hospital.

This method consists in making long incisions and free dissections of sections of fascial covering or aponeurosis covering the muscles. One can cut through the whole thickness of the superficial fascia, and then cut from one extremity to the other of the long axis of the limb ribbon of muscle or fascia.

In some cases the results are brilliant from this operation, while in others they have not been so good. In a case of elephantiasis I operated on this fall the results were not perfect but the patient improved 25 per cent. Dr. Eisendrath had operated on the same patient at his clinic by the Kondoleon method and his results were somewhat similar; but later the patient had a relapse.

DR. DANIEL N. EISENDRATH: This patient concerning whom Dr. Andrews speaks had an enormous lymphœdema. At the end of a year there was a large growth. When I re-examined her I found the limb had decreased in circumference about five or six inches. One can hardly conceive of the former size of this woman's limb; it was 18 or 20 inches in circumference. The thickening of the deep fascia prevents any communication between the superficial and deep lymph-vessels, and the idea of Kondoleon and the idea carried out by Dr. Golden is to establish some sort of collateral circulation so that the deep lymphatics will take up the work of the superficial. I followed Kondoleon's technique in every detail. I took out a section of the fascia of the thigh as large as the outstretched hand. I rolled it up into a strand into the portion we had excised, and then stitched it into the deep muscles, and did the same with the leg proper.

The trouble with these cases is this: for a year and a half as long as there is a possibility of communication between the deep and superficial lymphatics, improvement takes place, but as soon as the fascia begins to contract down upon the transplant, the result is practically the same as Dr. Andrews described. Dr. Andrews operated on the same woman two years later, at which time her condition was as bad as when I started.

HEPATITIS AS A CONSTANT ACCOMPANIMENT OF CHOLECYSTITIS

DR. EVARTS GRAHAM read a paper entitled "Hepatitis as a Constant Accompaniment of Cholecystitis," with lantern slide demonstration. (See p. 521.)

DISCUSSION

DR. COLEMAN G. BUFORD: I sincerely appreciate the points concerning the bacteriology and the long duration in which bacteria are present in the bile as referred to by Dr. Graham, because I have been rather distressed about the frequency of papers in the last few years concerning the frequent return of gall-stones in the experience of some surgeons and the need of secondary cholecystectomies. I have felt that very much unnecessary work was being done in connection with both primary and secondary cholecystectomy. During the nearly four years that I was associated with Dr. Fenger I do not recall that we had to do a cholecystectomy on account of recurrence of stones and I recall only one secondary cholecystectomy among the private patients for stenosis of the cystic duct following the removal of stones. That is quite parallel with my own experience. I have tried to reason out why these men are having so many recurrences of gall-stones, and why is it so many surgeons are taking out so many gall-bladders even at the primary

operations. I think it is because that they have not drained their gall-bladders long enough and their ill experiences have led to undue fear of all gall-bladders. As I watch the younger generation of surgeons I find that they are taking out the drainage tubes in ten days or two or three weeks often strapping the sinus at once to close it. We did not do that in the days of Dr. Fenger nor do I do it now. It was not an uncommon thing in those days to drain gall-bladder cases five to seven weeks.

Dr. Graham has certainly brought out some very important points, and among them the persistence of bacterial flora in the liver secretions after drainage of the gall-tract. Upon the basis of his report and corroborative clinical experience which I have cited, I think we had better go back to the old practice of draining our gall-bladders much longer.

Dr. Daniel N. Eisendrath: We must admire Dr. Graham for his courage and for taking sections from every one of his cases. He has shown plainly that every case of even mild cholecystitis is accompanied by hepatic changes. If there is anything we surgeons ought to impress upon the medical men today it is this, that the longer a patient has a primary infection, the more the changes that take place in the liver.

The majority of the sections shown were really examples of incipient or early cholangitis, where the intracellular infiltration was within the lobule itself. I would like to ask whether any change in the staining qualities of the cell was noticed? This is important, because this is the earliest stage Graham has shown. Cases with infection during months and years, get a more advanced degree of cholangitis the longer the condition lasts, and when the case comes to operation drainage of the common duct or gall-bladder cannot cure the case, if changes more or less permanent have taken place in the liver, resulting in a condition of hepatic insufficiency. The patients do not pick up from the condition and die of a condition we commonly speak of as cholæmia, a chronic sepsis. It has been pointed out that patients may for ten years have repeated attacks of cholecystitis and develop anuria after operation. I find in looking up the literature that there are a number of cases of this kind reported, and in experiments that have been made upon animals it has been shown that following the gall-bladder operation the patient did not pass urine for three or four days. In many cases the anuria lasted nearly 24 hours following operation. Whether this reaction was due to the liver not being able to take care of some of the secretion or metallic substance, is something still unsolved.

The question brought up by Dr. Buford is one that is a lively subject for debate. Some experiments were made years ago which showed plainly the presence of bacteria in cases in which gall-bladder drainage was resorted to and that, as a rule, no matter how many bacteria at first disappeared, the average period in which drainage is of any benefit, when we do a cholecystostomy, is only for about three weeks. These changes go on and on until the liver is converted into a hard fibrous mass as a result of the constant obstruction by stones, and an advanced cholangitis results, which is what carries away our patients more than any other factor in connection with the operation.

Dr. L. L. McArthur: This subject is interesting to me because it recalls the teaching of Thoma who gave me my course in histopathology. We made sections of cirrhosis of the liver of the biliary and portal type. The differential diagnosis was made according as the infiltrations took place around the biliary radicles or around the portal terminals. The differential diagnosis of the form of cirrhosis was assisted in that way. He also taught us that there was a hypertrophic stage in the acute form of biliary cirrhosis, as well as in the acute stage of the portal type of cirrhosis.

These clinical demonstrations made for us in operating are beautiful and convincing. The lesson to be learned from them is that even with the extirpation of the gall-bladder, the drainage of the biliary tract that has made the extirpation of the gall-bladder necessary is extremely desirable.

I agree with Graham that an infection will extend from the circulation to the liver and the bile tracts quite as frequently as by the ascending form. This same colon bacillus does not pass up a tract to get into the kidney when we have a colon pyelitis, but it gains its exit from the blood going to the kidneys, here being eliminated (as are a great variety of other bacteria by that route and by the biliary tract similarly). The conviction has been very definitely forced on my mind that in the cases of cholangitis associated with septic gall-bladders, it is the factor of ether anæsthesia or chloroform anæsthesia, in addition to the laming of the liver cells by the infective element that makes this anuria. I have been complimented to find that Clairmont and von Haberer have both adopted the suggestion made by me, of introducing large quantities of fluid through the tube (which they have in the bile tract for the purpose of bile drainage) into the duodenum through the tract and deluging the mucosa of the small intestine and kidneys, so that the anuria is again obviated. Matas, of New Orleans, has reported three cases in which all other treatment had failed, and then the injection of hot Vichy water through the tube saved his patients.

Dr. Graham (closing): In answer to the question asked by Dr. Eisendrath with reference to a change in the staining quality of the cell, I will say that I chose sections to illustrate the subject purposely from cases which were not very striking instances of cholecystitis, with marked sepsis, and so on, but to establish the point in relatively trivial cases there is a definite change in the liver. In regard to the change in the staining quality, there is a noticeable change in the staining quality of liver cells, particularly in the more severe type of disease. There is not only a change in the staining quality but other changes as manifested by beginning fatty infiltra-

tion, and so on. When we reach the condition of well marked cirrhotic change of definite, firm, hard liver, we see a large liver lobule entirely destroyed and substituted for it well marked connective tissue around the lobule.

In regard to the length of time in which bacteria may come out of the liver, I intended to mention, but possibly I forgot it, that the observation which Terrier made in 1894 was to the effect that bacteria may be found coming out of the drainage tube for months after the establishment of a fistula; in one case four months after the establishment of a biliary fistula, he remembered getting colon bacilli in large numbers.

HÆMORRHAGE SECONDARY TO NEPHROLITHOTOMY

DR. JACOB FRANK read a paper entitled "Hæmorrhage Secondary to Nephrolithotomy." (See p. 538.)

DISCUSSION

DR. JOHN A. WOLFER: In speaking of hæmorrhage following nephrotomy, about two years ago at the Cook County Hospital, Dr. Kanavel removed a stone by sectioning the kidney in which there was considerable infection. About 10 days later the man started to bleed violently from the wound and passed bright red blood from the ureter into the bladder. He urinated almost bright red blood; and rapidly became exsanguinated. In six or eight hours the red blood count dropped down very materially, and the hæmoglobin to thirty. We transfused the patient by the citrate method, hoping to build up the red count again sufficiently to be able to do a nephrectomy. He stopped bleeding at once and has not bled since, and he still has his kidney.

DR. L. L. MCARTHUR: Hæmorrhage from the kidney not infrequently results from a blow on the kidney. The hæmorrhage is apt to continue and require surgical interference. The mere opening down to the kidney and draining the pelvis of the kidney will stop the hæmorrhage. It does not require extirpation of the kidney to stop the hæmorrhage. I have several times checked hæmorrhage from the kidney by adopting such a method.

DR. FRANK (closing): I thoroughly understand that a slight hæmorrhage from the kidney will stop, but when a patient is dying you must do something more than rely on bathing the parts with the salts of the urine. About thirty years ago I did a section of a kidney, shortly after which the patient began to bleed and before I could reach him he was dead. I remember another case of trauma of the kidney in a little girl who had fallen on a sidewalk, causing a rupture of the kidney. A large perirenal hæmatoma formed. I operated on her and thought she was going to get well, when suddenly, more than a week afterward she began to bleed and before I could get to her she was dead. I am sure the patient whose case I have just related would not have died if I had performed pyelotomy, thereby preventing back pressure. Where urine is put up in the kidney or tissues it will cause infection unless it has an outlet.

In the case I have reported I made a clean cut and sewed it up so as to afford the best possible advantage for primary union to take place. There was not as much blood in the urine as after an ordinary pyelotomy. After a nephrotomy we naturally would expect a large flow of blood into the bladder. When the entire ureter is blocked with blood, what happens? The secreted urine of the kidney involved has no outlet and it must back up. It must overwhelm the kidney. The tissues become soaked and œdematous, and if it remains for a few days the secretion will become putrid and infect the kidney. The secretion of the kidney must have an outlet. If the urine cannot get through the ureter it prevents union of the tissues. Hæmorrhage occurs.

The removal of calculi from within the parenchyma via a total nephrotomy is much more of a risk than the removal of stones embedded in the extreme upper part of the pelvis. I have here ten stones which I took out of the parenchyma of the kidney. You must understand that it required a great deal of manipulation to do that, and if primary union was not obtained, we would have profuse hæmorrhage, naturally. These are the cases I have reference to that require, in addition to the nephrotomy, a pyelotomy. I have had three similar cases since that made uninterrupted recoveries by the method I have just described.

THE ENTRANCE OF AIR INTO THE MEDIASTINUM DURING OPERATIONS ON THE NECK

DR. COLEMAN G. BUFORD read a paper entitled "The Entrance of Air into the Mediastinum During Operations on the Neck." (See p. 540.)

DISCUSSION

DR. SAMUEL C. PLUMMER: I have not had experience with any case where symptoms were caused by air being drawn down into the mediastinum during inspiration. I am, however, familiar with the fact that air is drawn in there in operations low down on the neck, especially the operation for the removal of tubercular glands where we follow down behind the clavicle into the angle between the internal juglar and subclavian vein. This sound of air being drawn in is startling because it suggests an opening of one of the veins and air embolism. My practice is to plug up immediately this space with a piece of gauze which stops further inspiration of air and also relieves the noise which is so disconcerting. When the air is under pressure it leads to the symptoms Dr. Buford speaks of. It is rational treatment to see that there is an opening there through which the air can escape.

In writing on two cases of injuries of the thoracic duct which occurred while I was assisting Dr. Fenger in connection with the removal of tubercular glands of the neck, I called attention to the aspiration of air which made this startling noise, and after

I submitted my manuscript to Dr. Fenger he suggested that I add to it that sometimes air is drawn down into the mediastinum and around the heart and can be detected on auscultation by crepitating sounds both with respiration and with the heart's action. He did not, however, speak of any serious results from that, and possibly up to that time he may not have had any. It was more a matter of scientific interest than of any clinical significance according to the way he presented it at that time.

DR. DAVID C. STRAUS: In connection with Dr. Buford's paper I should like to mention a case which I think is of interest. The patient, M. H., Michael Reese Hospital No. 83953, a male Austrian, 23 years of age, was brought to the hospital at 5:30 p.m., December 21, 1915, with the typical history and symptoms of acute appendicitis, and was admitted to the surgical service as a case for immediate operation.

The past history was negative. He had never had a similar previous attack. His history was negative also as regards chronic cough, night sweats, or dyspnœa.

There did not seem to be any question about the correctness of the diagnosis. His temperature was 101.4° (rectally), pulse 82, and respirations 32 per minute. There was marked, almost board-like rigidity over the right side of the abdomen, and this was more marked in the right lower quadrant, and there was marked tenderness in the vicinity of McBurney's point. The white blood count was 17,600.

I examined the chest carefully, as I regularly do in these cases, to prevent overlooking a possible diaphragmatic pleurisy or a beginning pneumonia. The lung findings were entirely normal before the operation was begun.

I performed an appendectomy in the usual manner and inserted a drain. The operation was not particularly difficult and was completed without incident or complication. The patient took the anæsthetic badly, however, and coughed and choked considerably before he finally relaxed. During the operation he had more or less difficulty in breathing, but not more than is often observed.

At operation I found a gangrenous appendix and considerable free cloudy fluid in the abdomen. He left the table in good condition, though his respirations were rather rapid. The record shows that on his return to bed, at 10:40 p.m., his pulse was 118 and of good quality, his color was good, but his respirations were slightly labored and were 52 per minute.

By midnight the pulse had come down to 104, and his respirations to 44 per minute, but they were still labored. By 2:30 a.m. the pulse and respirations had risen again to 114 and 52 respectively, and the patient coughed occasionally. His difficulty in breathing increased, and at 7 a.m. he suddenly developed a terrific attack of dyspnœa, respirations were labored to the extreme and were 56 per minute, and the pulse was 140. The patient was intensely cyanotic, his lips, ears, and extremities were absolutely blue, and his entire face was dusky. He was struggling for air, or rather struggling to expell what air he had in his chest, as expirations were greatly prolonged and inspirations were merely short gasps. He was given a hypodermic injection of morphine sulphate $\frac{1}{6}$ grain with atropine sulphate $\frac{1}{150}$ grain. Following this hypodermic medication the condition seemed to be somewhat relieved. On examining his chest I found that the entire left lung was markedly emphysematous, the cardiac dullness being completely obliterated, percussion giving a hyperresonant note over the entire left side of his chest. The right lung showed normal findings on percussion. The whole chest was filled with wheezing sounds accompanying expiration, as well as numerous moist bubbling râles. The expiration was loud and prolonged, but not of the tubular type. The abdomen was negative, was not tympanitic, and was not distended. There was but little sputum, and this did not contain blood. There was nothing to suggest pulmonary embolism. The condition seemed to be due to acute interstitial emphysema of the left lung.

As the patient's condition now was not so desperate, there seemed no indication to do anything but watch him carefully.

That afternoon, December 22, subcutaneous emphysema was plainly to be made out just above the manubrium sterni, in the suprasternal fossa, and on both sides of his trachea in the neck. There was also some in both supraclavicular fossæ, but more on the left side than on the right. On palpation the skin in these areas gave the typical crackling sensation that is so characteristic. It was now evident that the patient was suffering from mediastinal emphysema. During the straining while going under the anæsthetic there probably had resulted a rupture in one of the air passages in the left lung, probably in one of the smaller bronchioles. The escaped air had filtered through the interstitial tissue of this lung, and being held within the lung by the visceral pleura, so that it could not escape into the pleural cavity to form a pneumothorax, it could only escape toward the hilus and following the larger bronchi and large vessels, had escaped into the mediastinum and upward into the subcutaneous tissue of the neck. The sudden suffocative attack in the morning had probably been caused by pressure upon or displacement of the larger vessels and heart, by the escaped air.

I considered the possible necessity of and was prepared to carry out the procedure suggested and used with success in a case by Tiegel. This consists in making a transverse incision in the jugulum and applying a Bier's suction cup and aspirating the air from the mediastinum. But his condition gradually improved and this did not seem indicated though he was still quite cyanotic.

The cyanosis did not entirely disappear until January 6, 1916. On December 29 I had roentgenograms taken of his chest. These did not dis-

close any pathological condition to account for the development of the interstitial emphysema. Apparently the condition had been caused by severe straining at the time the anæsthetic was being administered.

The patient made an otherwise uneventful recovery, and was discharged on January 9, 1916, cured.

DR. E. C. RIEBEL: I wish to speak in confirmation of this mediastinal disturbance by saying that we have a similar condition in pneumothorax. It has been claimed by a number of experimenters that the entire symptom-complex of pneumothorax is due to a displacement of the mediastinum, but inasmuch as venesection in Dr. Buford's case was accompanied by prompt relief, it still more confirms that idea, because evidently the vessels at the base of the heart were kinked and as there was relief of the venous congestion the vessels straightened out. The reason that symptoms do not occur with regularity is due to the variable structure of the mediastinum in various individuals. We know that we can open the chest cavity in one patient with perfect impunity and have no symptom-complex follow. In another patient it will be followed by an extremely stormy symptom-complex, and those differences are undoubtedly due to the various degrees of rigidity of the mediastinum, permitting either slight or marked displacement.

In regard to the wounds of the lung and emphysema, I had an experience of that type several years ago, and in that condition we are dealing with tension pneumothorax which forces air from the parietal pleura along the way into the mediastinum, and the best way of treating such cases is by the method of Bramann, who resorted to a small thoracotomy, inserted a tube, sewed it tightly, and tied to the tube a very thin rubber glove finger or something of that kind which permits at each expiration the air to escape. The glove finger falls over as soon as inspiration ceases and when expiration occurs the opening is closed. Thus the air is pumped out during inspiration and none can enter during expiration.

DR. CARL BECK: In 1916, Boehler, a surgeon engaged in war surgery abroad, published a paper entitled "Gunshot Wounds of the Larynx." This appeared in SURGERY, GYNECOLOGY AND OBSTETRICS of September, 1915. In his paper the author referred to conditions similar to those mentioned by Dr. Buford. This surgeon, who had had a large experience in war injuries, observed that a great many soldiers with gunshot wounds died so suddenly from emphysema of the head, neck and chest, that the head became like a blue rubber ball. Post-mortem examinations on these cases revealed an emphysema which extended over the neck and head. He advised the soldiers that should any such thing develop to use a bayonet for the time being and send the wounded man to the hospital. He saved the lives of many men in this way by afterward treating them in a hospital.

DR. BUFORD (closing): As this subject has come before me it has interested me more than the most of you, but I am certain that if you ever saw this clinical picture you would become interested in it also. These patients hold their breath for a long time and their jaws are more rigid than in any condition I am familiar with, and one must struggle to release the jaw to do artificial respiration. Artificial respiration does help some. I do not believe there is much promised through incising the skin in mediastinal emphysema in the acute cases. I do not believe they will get relief through high punctures or opening the original wound. I am certain more air would be drawn in. If anything is done the anterior mediastinum must be punctured and I still doubt whether puncture is of much value. As to whether there would be suction when we open in front of the mediastinum, I do not know.

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD NOVEMBER 16, 1917, WITH THE PRESIDENT, DR. N. SPROAT HEANEY, IN THE CHAIR

DR. ARTHUR H. CURTIS reported two cases: 1. Interstitial Pregnancy. 2. Adenomyoma of the recto-vaginal septum. (See p. 551).

REPORTS OF CASES AND EXHIBITION OF SPECIMENS

DR. BERTHA VAN HOOSEN: This specimen was removed from a woman who had practically a double uterus, although one of the uteri is miniature. The patient has been married for ten years and has had eight pregnancies. Three of the children were delivered at full term, and five were aborted at two, three, five, one, and seven months respectively. The patient had been complaining for the past two years of a great deal of backache and abdominal pain. She had a retroversion of the uterus. In order to relieve her symptoms and as she desired to become sterile, this specimen was removed. One round ligament came off from the tiny half of the uterus, while the other round ligament came off from the other side. You will notice the cervix was partly removed.

The second specimen I want you to see because I believe no one is in the habit of removing the entire

cervix far down to the vaginal mucosa and taking away all the cervical tissue in a supravaginal hysterectomy. There were a number of small fibroids connected with this.

The third specimen was removed in the same way so as to leave all the blood-vessels intact. This is a fibroid uterus that is pregnant between three and four months. The patient had had hæmorrhages for three weeks. She had been pregnant seven times, with three children delivered at full term. There were so many fibroids at the lower junction near the cervix that it seemed wise to remove the whole uterus. It looks as though it might have been a case of placenta prævia.

RUPTURED TUBAL PREGNANCY

DR. JOSEPH L. BAER: I have here colored photographs of a case of Dr. Frankenthal's of ruptured tubal pregnancy. Briefly, the clinical history is this: the patient, while a guest at the Blackstone Hotel, suddenly fainted in the bathroom. She was taken to St. Luke's Hospital, Dr. Frankenthal examined her there, and made a diagnosis of ruptured tubal pregnancy. Operation confirmed the diagnosis. This colored photograph shows typical interstitial pregnancy which answers the requirements just outlined by Dr. Curtis. She had had two children previously, yet there was an interval of seven years, followed by this ruptured interstitial pregnancy.

DR. HEANEY: What is the condition of the ovary?

DR. BAER: It is cystic.

DR. HEANEY: What about hæmorrhage?

DR. BAER: I think the hæmorrhage was free into the abdominal cavity.

RUPTURE OF THE UTERUS

DR. N. SPROAT HEANEY: I wish to report a case of rupture of the uterus which is interesting from several standpoints.

A young negro woman entered labor and the fœtal head presented at the vulva at 6 o'clock in the morning. After a severe pain the head receded three inches. About 9 o'clock the physician applied forceps and delivered a dead child. An hour and a half later expression of the placenta under anæsthetic was made. Manual removal of the placenta was attempted about noon, but the placenta could not be found. Around 3 o'clock a second physician examined the patient and also could not find the placenta.

The patient was then referred to the Presbyterian Hospital as a case of retained placenta. The senior interne also attempted to remove the placenta and made a diagnosis of a rupture of the uterus. At 5:30 I saw the patient and found her with a pulse of 150, but of good quality. I did a laparotomy and found the placenta in the abdomen near the spleen. The cervix was torn the whole length of the lower uterosegment. The bladder was separated transversely from the uterus from round ligament to round ligament. The uterine artery on the right side was bleeding. I did a hysterectomy and left in a gauze pack in the cul-de-sac through the vagina and also abdominal drains. The blood filling the peritoneal cavity showed evidence of infection, was muddy in color and with a bad odor. The tissue around the rupture was covered with a dark grayish deposit. The patient lost very little blood and returned to her bed in very good condition. Her maximum temperature was 102° on the second day, and on the fifth day her maximum temperature was 100° and her pulse 120. She, however, died on the tenth day from general peritonitis.

VICARIOUS MENSTRUATION

DR. JOSEPH L. BAER: I should like to hear an expression of opinion regarding a case I have under observation now. The patient presented herself at the dispensary two weeks ago with the following history: she is 22 years of age, has been married two years, and has never menstruated. During the two years of her married life she began to have monthly sensations in the breasts as though they were going to swell and that was all she noticed. She was able to have intercourse without any discomfort. Examination revealed a vagina normally wide at the atrium and about two inches deep. It terminated abruptly and smoothly. Beyond that vaginally there is nothing to be felt. With combined rectovaginal and abdominal examination, at about three centimeters above the termination of the vaginal tube there was the vestige of a uterus in the shape of a very small transversely placed mass not bigger around than a fine lead pencil and two centimeters across. In connection with it there was a small left-sided ovary, and another strand running to the right side and blindly to the pelvic wall. While this anomaly in itself is exceedingly rare still it occurs; but the thing of interest to me was that during the two years of her married life she claimed to have monthly staining of her underwear from red sweat in the axillæ, and when I saw her axillary hairs and axillary skin they were distinctly stained reddish pink. Chemical test shows the presence of blood (hæmatin) in the axilla. She has all the normal characteristics of a female. She has normal breasts; she has female pelvic measurements, but the thing that interested me particularly was the question of vicarious menstruation and I would like to know if others have seen similar cases.

DR. EMIL RIES: I have never seen a case of vicarious menstruation, and I have never seen one demonstrated by any one else that proved to be vicarious menstruation when examined properly.

Dr. Baer's case is rather striking. He ought to put every possible safeguard around this case so as to be absolutely sure it is a case of true vicarious menstruation. I would like to have that blood put under the microscope and see if it is really human blood.

DR. BAER: We carefully shaved the one axilla, avoiding the slightest scratch so that there should be no blood added to the denudation of the skin. The patient's axilla had first been washed with a cotton pledget and plain water, pledget and washings sent to the laboratory and the presence of hæmatin was

reported. The underwear was seen by half a dozen men at the time the patient was examined in the hospital and there is no doubt about the color of it. She is to be admitted to the Michael Reese Hospital for controlled observation.

DR. RIES: Hæmatin does not prove that it was human blood that was in her axilla. Unless human blood-corpuscles are shown coming out of the skin of her axilla, I should suspect the case to be a factitious one.

FŒTAL DEATH DURING LABOR

DR. CHARLES B. REED read a paper entitled "Fœtal Death During Labor." (See p. 545.)

DISCUSSION

DR. CHARLES E. PADDOCK: I can add little to Dr. Reed's remarks as he has so completely covered the subject. Asphyxia of the newborn is entirely too frequent and may be put down as one of the preventable accidents of childbirth. Carelessness on the part of the accoucheur and the haphazard way in which so many of the obstetrical cases are conducted and a want of appreciation of the condition of the fœtus *in utero* during delivery account for many asphyxiated newborn.

Most of the deliveries are made in homes and attended carelessly, and any sudden change in the condition of the baby goes unnoticed. The baby is born dead, the cause unknown. The physician is blamed by the family and not unjustly in the majority of cases.

I believe a tight cord around the neck of the child in the second stage of labor is one of the most usual causes of asphyxia. An observing physician would have detected the condition by frequent auscultation of the fœtal heart and have applied forceps. Because of a want of assistance at a case conducted at home the physician often delays in interfering with labor or applying forceps, until it is too late to save the child. In hospital practice the fœtal mortality is much lower than at the homes. This is natural because of the facilities for giving the woman in labor better attention, with internes constantly watching the fœtal heart tones and all conditions present to terminate the case at a moment's notice.

As I look back, I am convinced that many cases of latent asphyxia were due to thymus enlargement, instead of causes attributed as meningeal, heart disease, etc. The number of such cases which have been revealed by acute observation is surprising, and the results of X-ray therapy were most gratifying.

After an experience, extending over a good many years, mainly devoted to an obstetrical practice, I have tried all forms of anæsthesia and am convinced that ether, chloroform, nitrous oxide, all have their place in obstetric anæsthesia. For a great many years chloroform or the A.C.E. mixture was the favorite and I have yet to see a mother or child injured in any way by their use. Because of the unfavorable reports, chloroform was abandoned and ether used, but the result was not satisfactory. The rapidity of its action and the rapidity of its disappearance are the qualifications necessary in an anæsthetic in obstetrical work. This we have in chloroform, which we have not in ether. Ether should be reserved for obstetrical operation. Nitrous oxide is used in hospital obstetrical practice. It must be given by an expert. It is not the ideal anæsthetic for the delivery of the head.

During the first stage of labor chloral hydrate may be given and is very useful in quieting an irritable uterus in a very nervous patient. It has no bad effect upon either mother or child. I am not an advocate of the use of scopolamine morphine as a routine practice. I have seen its bad effects upon the child and I have also witnessed the flushed, contorted features of the patient with her maniacal symptoms. The labor is usually prolonged and forceps are indicated. Postpartum hæmorrhage is more frequent. Notwithstanding reports to the contrary, I am convinced that scopolamine and morphine as generally used is a pernicious analgesia. We are saving the patient a little temporary suffering at the risk of the child. It undoubtedly has its place in obstetric analgesia, but only in well selected cases.

Regarding the use of pituitrin I certainly agree with what the essayist has said. I do not know of any agent that has come to us in the past few years which has been such a life saver as pituitrin when used properly. On the other hand, it has done a lot of harm, and much of this harm comes from the reports that have gone out in the magazines and reports from the proprietary houses regarding the use of it in labor. But pituitrin used as Dr. Reed uses it, or as any other member of this society would use it, has done a lot of good.

DR. CHARLES S. BACON: I do not see how we can determine the cause of fœtal deaths with any certainty until we get more postmortem examinations of stillborn children. While we do not know whether there are intracranial hæmorrhages or not, it is difficult to say what is the cause of death, and as Dr. Reed has said, many of the hæmorrhages which we find with a simple examination may be due to injuries that occur at the time of death, but are not really the cause of death. I do not know how many deaths occur in the last part of labor before the rupture of the membranes. I have an idea that deaths are very often due to disturbance of the placenta or maternal circulation. It may occur at any time, and the emphasis given to the pressure of the head of the child or th · body of the child may possibly be exaggerated. It is a common experience to find this history, that the fœtal heart tones have failed, and the intra-uterine death was preceded by a period, perhaps not very long, of tetanic contractions of the uterus. In those cases there is no question but what anæsthesia or analgesia produced by morphine may be a preventive measure if the child is saved by the use of an analgesic. That is the chief point I wish to make.

DR. C. HENRY DAVIS: Is it well in many cases to wait until the fœtal heart tones are definitely bad

before applying forceps? In those cases in which we have a strong second stage contraction extending over a considerable period without definite progressive advancement, I think something should be done toward terminating labor. In the second place, I wish to emphasize the necessity of microscopic examination of fœtal tissues whenever autopsies are made upon babies who are stillborn or which die within the first week subsequent to birth. This will often explain the cause of death when the microscopic findings may not. In the third place, I think that Dr. Reed has done well in calling our attention to the dangers of using pituitrin in cases where the fœtus is already endangered by birth asphyxia. Pituitrin increases the asphyxiation and may be the exciting cause of fœtal death. At the Presbyterian Hospital we have almost limited the use of pituitrin to the third stage of labor. We do not use it more than two or three times in a hundred deliveries before the third stage of labor.

So far as anæsthetics are concerned, there are no statistics which will indicate that the proper use of any anæsthetic agent is as dangerous to the mother or to the baby as a long, hard, painful labor. When it comes to the individual anæsthetic, ether and chloroform, because of their closer affinity with the tissues, are not as quickly eliminated as nitrous oxid, and therefore will affect the baby to a greater extent.

In the use of forceps I would like to call attention to the type of blade. Undoubtedly the Tarnier type of instrument, with long cephalic curve, is more dangerous, as ordinarily applied, than the Simpson type of instrument which has a cephalic curve which does not make as great pressure on the fœtal head.

PROBLEMS ENCOUNTERED IN ABDOMINAL OPERATIONS

Dr. Thomas J. Watkins outlined some problems encountered in abdominal operations. (See p. 543).

DISCUSSION

Dr. Richard R. Smith, Grand Rapids, Michigan: I have been very much interested in Dr. Watkins' paper, for many of the things that he has spoken of we ourselves have followed out.

In reference to the anæsthetic, we have used also nitrous-oxid-oxygen for a considerable number of years, using it oftentimes with combinations of ether at one stage of the operation. I think one should not be too much carried away with the idea that we must use nitrous-oxid-oxygen in all abdominal work. We find the addition of a little ether after one stage is a great help and should be used.

In carrying out the anæsthetic, there is one point that should be emphasized, namely, the necessity of having but one anæsthetizer to give anæsthetics. Of course, it is not possible in Chicago hospitals to do that always, but where it can be done it seems to me it is of the greatest possible advantage. Personally, in 20 years' surgical work I have had but three anæsthetizers. The first man was with me eight years, and I had one man for twelve years. This man makes a study of anæsthetics. He is an older man; he is mature; he knows the literature of the subject and follows it very closely, therefore he is able to administer the various anæsthetics well, and we have found it of the greatest possible advantage.

In reference to the rubber dam, we have been employing it for a year or two with the greatest advantage, and we have found, as Dr. Watkins has, that a heavier rubber pack is advantageous because it gives the additional bulk we want.

We have never closed the cervix; I have not thought it necessary. We also approximate the round ligaments in the manner spoken of by Dr. Watkins, and although we have not examined every case of supravaginal hysterectomy, in those examined we have found few cases indeed where the cervix has prolapsed.

I would like to go into the discussion of the indications for the removal of the uterus when the tubes are removed, but it is too large a subject and it is liable to become confused in considering it. Generally speaking, however, with the large percentage of operations we do in the pelvis, the matter of function should be first in our minds. The first question which should be answered as to the operation to be chosen is, Does this woman need her uterus, her tubes, her ovaries, and how far may we consistently and safely go in their preservation and maintain her health? I agree fully with Dr. Watkins relative to removing a diseased uterus, but occasionally it happens in a young woman, especially a young unmarried woman, that she likes to feel she is menstruating, that she is like other women, although she cannot bear children. This should be carefully discussed with the patient before an operation is done. There is a variation in the way these women feel about it, but I think it is very essential to have a clear understanding with a patient before we do any radical surgery.

Dr. N. Sproat Heaney: Dr. Watkins has presented a subject of very much importance. Dr. Watkins called attention to one or two points in technique which I should like to discuss. He gives us a dictum that the uterus should be removed when the tubes are taken out. Dr. Watkins no doubt had special cases in mind when he said this, especially cases of subacute infection of the pelvic organs. In such cases when the tubes are infected, the uterus is also diseased; and if the tubes are to be removed, the diseased uterus should probably not be left behind. However, it frequently happens that the patient's uterus has recovered entirely from the infection while the tubes still show some evidence of disease. For instance, there may be a small or a large bilateral hydrosalpinx with the uterus entirely normal. In such a case, Dr. Watkins also would no doubt remove only the tubes and would leave in the uterus and both ovaries, if both ovaries were entirely normal.

Whether menstruation is sentiment or not, or whether it is a process which is necessary in order that a woman may feel perfectly well, is one ques-

tion; and whether a patient considers that she is invalided by not being able to menstruate is another question. So long as so many women are convinced that it is necessary for them to menstruate if they are to remain well, we must be very slow in precipitating amenorrhœa. I myself believe that the laity and the profession lay too much stress upon this matter, but as long as patients are made nervous by the idea, I think we should give their opinions some consideration when their opinion is so necessary to their health.

I also do not believe that the uterus is necessary for the maintenance of normal ovaries but believe that the difficulties which ovaries meet after the removal of the uterus is largely due to a disturbance in the blood supply occasioned by the removal of the uterus. As ordinarily performed, a hysterectomy ties off the uterine and anastomosing uterine arteries and veins so that a severe disturbance in the blood supply to the ovaries results. I have found markedly enlarged ovaries in several cases a few weeks after hysterectomy, when at the time of operation the ovaries had been normal. Usually these ovaries returned gradually to a normal size, but they did not always do so. Sometimes they reach the size of an orange and necessitate removal the same as any other ovarian swelling of similar size may necessitate operation. However, in cases where the triangular resection of the uterus has been performed instead of an hysterectomy, I have never seen any change in the ovaries occur, and this fact I attribute to the undisturbed blood supply of the ovaries in this operation.

Dr. Curtis's suggestion to use a rubber pack in obstetrics in lieu of a bag or gauze packs is a good one and I believe is worthy of trial. We, however, should not later forget that Dr. Curtis originally suggested its use.

Dr. William C. Danforth: As to the question of leaving free blood in the abdominal cavity, in the last few years I have been leaving it as Dr. Watkins has said, removing, as a rule, in ruptured ectopic pregnancies merely the large clots which can be picked up with the hand, and I have yet to have a case in which trouble or disturbance has been caused after such treatment. I recall the case of one young woman who had considerable blood in the peritoneal cavity, which was left, and she made an uneventful recovery.

Not long ago a man was injured by the fall of a heavy automobile across the abdomen. I operated and found about a pint of free blood in the abdominal cavity. I stopped the hæmorrhage and allowed the blood in the cavity to remain. The patient made a good recovery. There is no question but that the presence of free blood in the abdominal cavity is without harm.

Dr. Arthur H. Curtis: With reference to rubber packing in abdominal surgical work, it is unquestionably valuable. Dr. Gellhorn, of St. Louis, uses heavy material and is responsible for the change from comparatively light to heavy rubber. As a result of a considerable experience, we have found that packing of the size and shape passed around for your inspection is the one most suitable for work in the average patient.

I would like to call your attention also to the use of the rubber pack in case one desires to use some sort of packing in the vagina. We employ radium a good deal, and in practically all radium cases, up to the period of six months we pack the vagina with gauze in order to give us adequate protection, and we found almost as a routine that there were a considerable number of vaginal adhesions. I think that almost no case escaped. Since that time I have been using the rubber pack instead of the gauze pack and have not encountered a single case in which there was adhesive vaginitis. It has occurred to many of us in obstetrical work that if one wishes to introduce rubber as a pack or packing, a very considerable gain can be made in packing the lower uterine segment and the cervical canal with rubber rather than with gauze. It becomes much less foul, is not so adherent, is easily removed, and causes no distress whatsoever.

Dr. Bertha Van Hoosen: I was delighted to hear what Dr. Watkins had to say with reference to the initial dose of scopolamine-morphine in doing away with the dread that patients have in coming to the operating room, and it occurred to me while he was speaking that he might be interested in knowing that this dread in going to the operating room is really equally surpassed by the dread that patients have of the preparation for operation. So many patients for many years have confided to me the very great shock and dread of the preliminary preparation the day before or evening before the operation, that I have now adopted the method by which all patients are enabled to secure a good night's sleep free from any of this shock to which we used to subject them. For instance, patients are entered in the afternoon, say three or four or five o'clock; they are given a cup of tea for supper, then given a colonic flushing, and nothing more is done. They have the night absolutely free without any shaving, any douches, or without any previous exhaustion from the administration of cathartics. In the morning they are given $\frac{1}{100}$ grain of morphine and $\frac{1}{150}$ grain of scopolamine and in an hour this is repeated. In 15 minutes after the second dose the patient is taken to the operating room, is shaved, not by a young nurse who does not know how to wield the razor, and maybe has a dull one, but by some one who is more competent to use a razor, so that the patient is in better shape in the operating room to proceed with thorough preparation. The third dose is given in the operating room, and then she is given two drops of equal parts of ether and alcohol or two drops of ether in chloroform, according as the anæsthetist prefers. In order to get over this test of postoperative pain, instead of waiting until the patient is nervous with pain, we begin, after the last dose of scopolamine is given, to administer $\frac{1}{100}$ grain of scopolamine, and $\frac{1}{100}$ grain of morphine. If you

give that dose in a severe pain you will find it is inefficient. However, to the patient who has not yet become accustomed to the pain, that has a very wonderful effect. In four hours this is repeated, that is, $\frac{1}{100}$ grain of scopolamine, and $\frac{1}{100}$ grain of morphine, is repeated every four hours until midnight of the second night.

In looking over our records, at least once a month and sometimes oftener, and taking them at random, and these records include laparotomies, perineorrhaphies, hysterectomies, and many other operations, we will probably not find a single case where it is said the patient did not sleep well the first night. The record states the patient slept fairly well or the patient slept well, and the best demonstration we can have is the testimony of our internes who have to look after the laparotomy cases the first night or two, and they say practically they are never bothered.

There is one other thing I want to mention, and that is in regard to menstruation. This subject was touched upon by Dr. Watkins. I feel perhaps that I have an advantage over you men in that patients confide in me a little more freely than they would to some of you. There is something that causes menstruation. There is a stimulus from the sexual gland which is conveyed through the sympathetic nervous system to the blood-vessels, so that the chain, when we do not have menstruation is interrupted, and it is that interruption that causes a certain degree of nervousness and irritability and a condition that is perhaps almost indescribable to the patient, but it will cause the patient to consult a doctor many times and she is considered to be neurasthenic, and her neurasthenia being due to an unknown cause or causes. But in the cases in which the menstruation of these patients is preserved it means that there is a great deal less disturbance in this chain. The chain has not been broken and patients are thus benefited.

Dr. Joseph L. Baer: Just a word concerning nitrous oxid. It has been my personal experience that the nitrous oxid which is manufactured fresh each day has a much quicker anæsthetic effect than the nitrous oxid that nearly all of us use in the compressed cylinders. Why this is, I do not know. I have discussed it with physiological chemists and they do not know, but unquestionably the testimony such as one can gather from the innumerable extraction specialists, who nearly all use freshly made nitrous oxid in large reservoirs, is of much value, and they tell us that they rarely have a patient who fails to go to sleep almost instantly, whereas those of us who are frequently in operating rooms where nitrous oxid-oxygen is in general use, occasionally find that in spite of a preliminary morphine dose, the patient is most resistent to the initial nitrous oxid-oxygen administration. That, too, I think accounts for the excellent results in Crile's clinic. As I understand it, they manufacture the nitrous oxid there on the premises.

I should like to ask Dr. Watkins whether it is his routine in gynecologic work to examine and remove a suspicious appendix, whether he explores the upper abdomen and the gall-bladder, and whether he removes stones from a quiescent gall-bladder without symptomatology? Furthermore, whether in his removal of tubes and uterus by supravaginal hysterectomy leaving one or both ovaries behind, he has never noticed a disturbance in circulation in the ovaries, making it necessary before closing the abdomen to remove the ovaries as well, aside from the risk of ultimate cystic degeneration?

Dr. Watkins (closing): I believe Dr. Van Hoosen's remarks relative to giving anodynes in small doses, after abdominal operations, and commencing the use before pain becomes severe, is a valuable procedure. I am firmly convinced, relative to the physiology of ovulation and menstruation, that menstruation is of absolutely no value except in its relation to reproduction; that menstruation is largely accidental in that it permits the uterus to return to its normal state after it has been disappointed in pregnancy (tears of blood). It is our custom always to examine the appendix and usually to remove it. Our experiences are that it is generally diseased in cases of severe pelvic disturbances. Gall-bladders, also, are always examined and gall-stones are invariably removed, unless there is some special reason for not doing so. We have had a large number of gall-stone cases, complicated with pelvic disease, for the last two or three years. We have been interested in the fact that patients with pelvic disease, complicated by gall-stones, frequently do not give a history of digestive disturbances before operation, but that later they almost invariably recall stomach symptoms. One case, recently, gave negative stomach symptoms in two history records taken before operation. After the operation she gave a history of having had stomach disturbances, of having had jaundice, biliary colic, and having had a diagnosis of gall-stones made.

We have the consent of the patient, in writing, before operating, to do whatever seems necessary at the time of operation.

As regards disturbance of the blood and nerve supply of the ovaries, we never remove the fallopian tubes unless they are diseased on account of making such disturbances. With care, however, the tubes can probably be removed without seriously disturbing the ovary. We have not had any special disturbances with the ovaries after doing hysterectomy for fibroids, as Dr. Heaney has mentioned, and believe that such disturbances of the ovary, after operative work, generally means the presence of a chronic infection. Cystic ovaries which occasionally occur after operation should be treated conservatively, as they generally disappear spontaneously.

In regard to the after-care, we believe that a large amount of fresh air, freely circulating through the room, is of great value as it relieves the nausea and vomiting 50 per cent, and is a valuable nerve sedative.

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS IN SURGERY

EDUCATING the physician of civil life of today to become a military surgeon tomorrow is a tremendous task, one might say impossible, yet in answer to the call to supply the physician with works on military medical science, in order that this may be made possible in a manner of fact, we have before us a number of most instructive works. Many are entirely new, others are revisions of older editions with this point in view.

Much as we knew in regard to infections, their bacteriology and transmission, and the manner of dissemination through the body, yet at the beginning of this great war, we as a profession were practically helpless in their active treatment. Drainage was instituted and the patient allowed to shift for himself as best he could by the assistance of his "resistance." The constant presence of infection in war wounds with the resultant high mortality in anatomic parts and in life itself, immediately stimulated surgeons and chemists to arduous study in the endeavor to find some way to curb the activity of this ever present and destructive host. Today we have in all probability a solution to the problem. The work of Carrel[1] is known throughout the world and its essentials in brief as bearing on infected wounds are well essayed in the little book at hand. The authors call attention to the necessity of exactness of detail in the treatment of wounds and their proper study in order that such treatment can be carried out intelligently. Success depends on several factors: first, the correct surgical cleansing of the wound; second, correct chemical solutions; and third, proper instillation of the antiseptics.

The method of preparation of Dakin's hypochlorite of soda is given in Chapter II, following this the technique of wound sterilization, the time and technique of mechanical cleansing of the wound, and the placing of the instillation tubes and methods of instillation of the fluid. They describe the methods of bacteriological examinations in detail, and the value this has in the treatment of the wound. A chapter is devoted to the closure of wounds, and the results are given in a final chapter.

One cannot suppress a great enthusiasm derived from reading this book. Here we are given real scientific methods for the treatment of infected wounds with results that seem almost miraculous and all within the reach of any surgeon who may diligently follow certain simple procedures. Many details in the technique seem unimportant, but upon the thoroughness with which these details are observed, depends success or failure. J. A. W.

DUE to the fact that a considerable portion of the detail in the technique for continuous application and instillation of Dakin's solution must be carried out by the nurses or attendant, Mme. Carrel's little book[2] was prepared especially for the purpose of aiding the attendant in the simple steps of the technique. It is a brief synopsis of the technique prepared especially for the nurse. The authors describe the materials used in the various dressings and apparatus for the instillation of the solutions, how these solutions are prepared, and how best to assist the surgeon doing the dressing. Many illustrations are given for the purpose of guiding the reader. The technique of a dressing is described, giving the materials used, the manner of placing the properly chosen instillation tubes, and the attachment of the irrigator. In an appendix, Dakin's fluid is described, giving methods of preparation and titration. Appendix II describes the microscopical examination of war wounds by the Carrel method. In closing an English and French glossary is given.
J. A. W.

WHEN different authors express their views on a subject, one is agreeably impressed to find repetition. It means as a rule that definite results are obtained. In going over the text of Keen's work,[3] we find much regarding the Carrel method of treatment of wounds. Many illustrations are taken from the previously mentioned book, and he describes from Carrel's work the technique as presented by the originator. A brief résumé is given of conditions encountered in the present war, which differ from those of other wars.

The subject of tetanus, gas infection, and gas gangrene are taken up briefly, showing the advances that have been made in prophylaxis and treatment. The author calls attention to the production of the antitoxins to prevent gas gangrene by the Rockefeller Institute. Wounds of the head, chest, abdomen, and joints, with a synopsis as to their treatment, are briefly mentioned, also the paraffin treatment of burns is discussed, giving formulæ for

[1] THE TREATMENT OF INFECTED WOUNDS. By A. Carrel and G. Dehelly. Translated by Herbert Child, R.A.M.C. With Introduction by Sir Anthony Bowlby, F.R.C.S. New York: Paul B. Hoeber, 1917.

[2] TECHNIC OF THE IRRIGATION TREATMENT OF WOUNDS BY THE CARREL METHOD. By J. Dumas and Anne Carrel. Authorized translation by Adrian V. S. Lambert, M.D. With introduction by W. W. Keen, M.D., LL.D., F.R.C.S. (Hon.). New York: Paul B. Hoeber, 1917.

[3] THE TREATMENT OF WAR WOUNDS. By W. W. Keen, M.D., LL.D. Philadelphia and London: W. B. Saunders Company, 1917.

the protective mixtures. In a closing chapter he publishes letters received in response to a letter "New Discoveries and their Application in the Treatment of Wounds in the present War." One is interested in what Blake, Bowlby, Cabot, Crile, Cushing, Gibson, and others have to say. J. A. W.

SINCE antiseptics are playing such a prominent rôle in the present day treatment of wounds, it is with much pleasure that one reads the little handbook by Dakin and Dunham.[1] This work is a flexible back, pocket size edition, well suited for the medical officer and contains a wonderful amount of concise information regarding practically all the known substances having antiseptic action. After a general introduction and classification of antiseptics, the different groups are considered. In the chapter devoted to the chlorine group are mentioned hypochlorous acid, its sodium and other salts including eupad, eusol, and Dakin's solution, chloramine-T and dichloramine-T. The chemistry and method of preparation of each as well as the results of experimental work on bacteria, are given. The phenol dyes, salts of the heavy metal, and miscellaneous groups are discussed in the same manner. A chapter devoted to methods of testing antiseptics, taking up lethal concentration, influence of media, time relations, velocity, and results. In the final chapter, the authors discuss disinfection of carriers and water, and disinfection of hospital ships with electrolytic hypochlorite, under the latter topic describing the apparatus necessary. The whole work, although brief, is very clear and concise and gives all the new facts to date, much of which cannot be found in the ordinary textbooks. J. A. W.

AS a companion to the previously mentioned handbook is the manual by Vedder,[2] also a flexible back, pocket edition, especially designed for the pocket of the medical officer. This edition was authorized by the Secretary of War and prepared under the supervision of the Surgeon General and the Council of National Defense. This is the Medical War Manual, No. 1. The edition is so arranged that at the close of each chapter there are a number of blank ruled pages which can be used to add notes, observations, etc. Chapter I is devoted to the camp, considering the recruit, sanitary survey of camp sites, sanitary orders, diet, including a table giving caloric values and the relative value of the various foods. The subject of water and disposal of waste is discussed in a very clear manner, and attention called to the importance of this phase of prophylaxis. The hygiene of the camp as related to ventilation of tents, overcrowding, recreation, physical training, venereal prophylaxis, is also considered. Chapter II is given over to the march. Here, again, attention is called to water, as to the amount given each man, when he should have it, and as to its purification. In the chapter on trenches and the battlefield, the matter of disposal of waste and flies, is again considered, also the diseases peculiar to this form of warfare are discussed. The subject of insects concerned in the transmission of disease is taken up in a chapter giving especial attention to the flea, mosquito, flies, lice, and the manner of eradicating of these pests. A final chapter is given to notes on transmissable diseases, giving a brief résumé of the infections and contagious diseases, how they may be detected, the manner of dissemination, and the manner best suited to eliminate carriers and sources of contamination.

Throughout the edition are many army orders illustrating conditions as they may be met. This edition is a true aid to the medical officer in meeting conditions as they are today in warfare. J. A. W.

THE physician of civil life can scarcely comprehend the great task before him on entering military life. One need only glance over the pages of Ford's work[3] to realize the manifold details of army life, the many pitfalls for the soldier, which jeopardize his health and life, all of which must be more or less controlled by the medical officer. Ford's work which is approved for publication by the Surgeon General of the United States Army, gives briefly the general scope for field hygiene and sanitation. When one remembers that in past wars the mortality from disease was in many cases far in excess of that from powder and shot; that armies have been defeated, military projects lost, nations destroyed by disease alone, then the importance of sanitation soon appears as one of the most, if not the foremost, problem of military organization.

The author attempts to give the medical officer who is unfamiliar with his new duties a general idea of the all-important duty which confronts him. The omission of even a detail may lead to unnecessary loss of life and greatly impair the efficiency of the command.

In a chapter on personal hygiene, the author, making use of the experience gained in the Mexican affair and from observations abroad, describes the personal care of the soldier. Every detail is given; the care of feet, the hands, clothing, the amount of rest, proper food, ventilation, recreation, the destruction of vermin, and many other items which might appear to be details, but which to the soldier are real issues, are discussed.

The march is described as to the distance to be covered by the various branches of military service and the precautions used by the medical officers for his troops, the water and food supply being important items.

In camp life the proper site for camp, the disposal of sewerage and waste, proper ventilation of

[1] A Handbook on Antiseptics. By Henry Drysdale Dakin, D.Sc., F.I.C., F.R.S., and Edward Kellogg Dunham, M.D. New York: The Macmillan Co., 1917.

[2] Sanitation for Medical Officers. By Edward B. Vedder, M.D., Lieutenant Colonel Medical Corps, U. S. A. Philadelphia and New York: Lea & Febiger, 1917.

[3] Elements of Field Hygiene and Sanitation. By Joseph H. Ford, B.S., A.M., M.D., Colonel, M.C., U. S. A. Philadelphia: P. Blakiston's Son & Co., 1917.

tents and houses, sanitary kitchens, mess halls and storage houses for food, are considered. Much detail is given regarding the proper construction of latrines and incinerators and the method used to prevent and overcome the fly pest. The water problem is always a mighty one in army life. The author gives the amounts necessary for each man and beast, the method of procuring it and of assuring safety in its use. He describes the method of purifying, inclining toward the use of halazone for sterilization. In a discussion on camp diseases, the usual diseases of the present war are briefly discussed. He divides them into filth diseases, insect-borne disease, diseases spread by discharges from the nose and mouth, and diseases caused by exposure. In an appendix are given illustrations and drawings of bath houses, mess halls, kitchens, latrines and crematories, hospitals and houses, ice boxes and the like. One must say the detail in the little work is enormous and invaluable to the medical officer. J. A. W.

THE intensity and magnitude of the present war brings us face to face with many new conditions. In the realm of medicine, probably no one phase is of more interest than shock. Eder,[1] in his little volume, reports in detail 100 cases of war shock with their clinical study and treatment. He accepts the classification of Freud and divides them into conversion-hysteria, which includes the affections of the senses and locomotion, fits, and so on; anxiety-hysteria where the condition of dread, anxiety, fear, is the prominent symptom and is due to some repressed unconscious mental complex; and psycho-asthenia. Of these 100 cases, 79 received suggestion under hypnotism, 5 received suggestion without hypnotism, 6 received suggestion under anæsthesia, 5 received psycho-analyses, 2 received other methods of treatment, and 3 cases received no treatment but were simply diagnosed. Of the 100 cases, 97 were treated and of these 97, 80 are cured, 14 are improved, and in 3 no change noted. It is interesting to note the psychological mechanisms in these cases, and the manner of study and analysis.

In conclusion the author states that "war shock is hysteria occurring in a person free from hereditary or personal psychoneurotic antecedents, but with a mind more responsive to psychical stimulus than the normal. The wrenching from customary calling and life, the new discipline, the peculiar and terrible mental strain of modern war conditions, acting upon this sensitive mind determine the disease among soldiers. Shell shock, gas poisoning, or other physical injuries do not cause the disease. The symptoms are protean-palsies, analgesia, amblyopia, mutism, deafness, affections of the vegetative system, such as the soldier's heart, vomiting, diarrhœa, insomnia, loss of memory, somnambulism, phobias, and obsessions of all kinds. These symptoms are the result of mental conflicts or other mental phenomena; all the symptoms can be understood in terms of the mind without any reference to physio-pathology. The treatment, par excellence, is hypnotic suggestion." J. A. W.

THIS compact volume[2] is issued as Medical War Manual No. 2, under the authorization of the Secretary of War and under the supervision of the Surgeon General and the Council of National Defense. Its contents comprise the first of a series of lectures delivered at the Army Medical School in Washington, the author laying claim to but little that is original, the material having been collected from various official publications. Its chief value lies in the fact that this material is unusually well formulated and most concretely and explicitly set forth, until such important subjects as Organization and Administration, War Surgery, and Sanitation have been boiled down to a mere 112 pages, and that, too, of such a size that the entire book may be carried in the medical officer's blouse pocket. The illustrations are simple outline drawings and are entirely adequate. None but an officer of the long practical experience such as the author has enjoyed could have reduced the subject to its simplest terms so successfully. More than ever at this time, will this volume be found to be not merely valuable, but essential. C. C.

[1] WAR-SHOCK. THE PSYCHO-NEUROSES IN WAR; PSYCHOLOGY AND TREATMENT. By M. D. Eder, B.Sc. (Lond.), M.R.C.S., L.R.C.P. (Lond.). Philadelphia: P. Blakiston's Son & Co., 1917.

[2] NOTES FOR ARMY MEDICAL OFFICERS. By Lieutenant Colonel T. H. Goodwin, R.A.M.C. With Introductory Note by Surgeon General William C. Gorgas, U. S. A. Philadelphia and New York: Lea & Febiger, 1917.

BOOKS RECEIVED

Books received are acknowledged in this department and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

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